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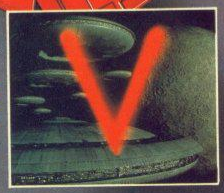

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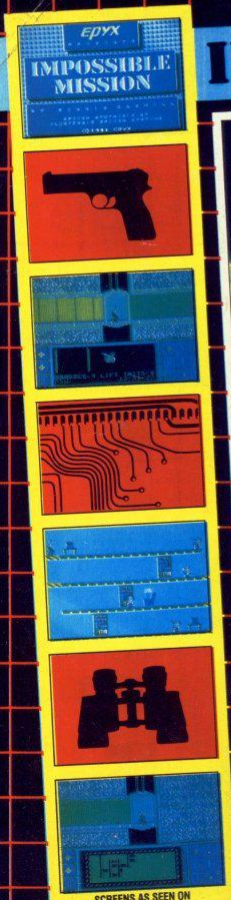

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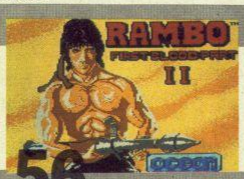

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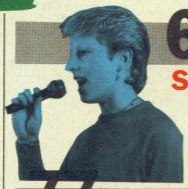

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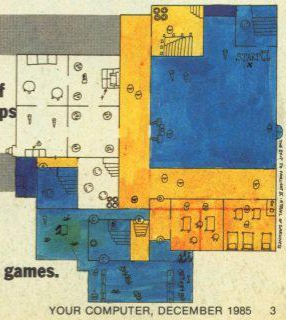

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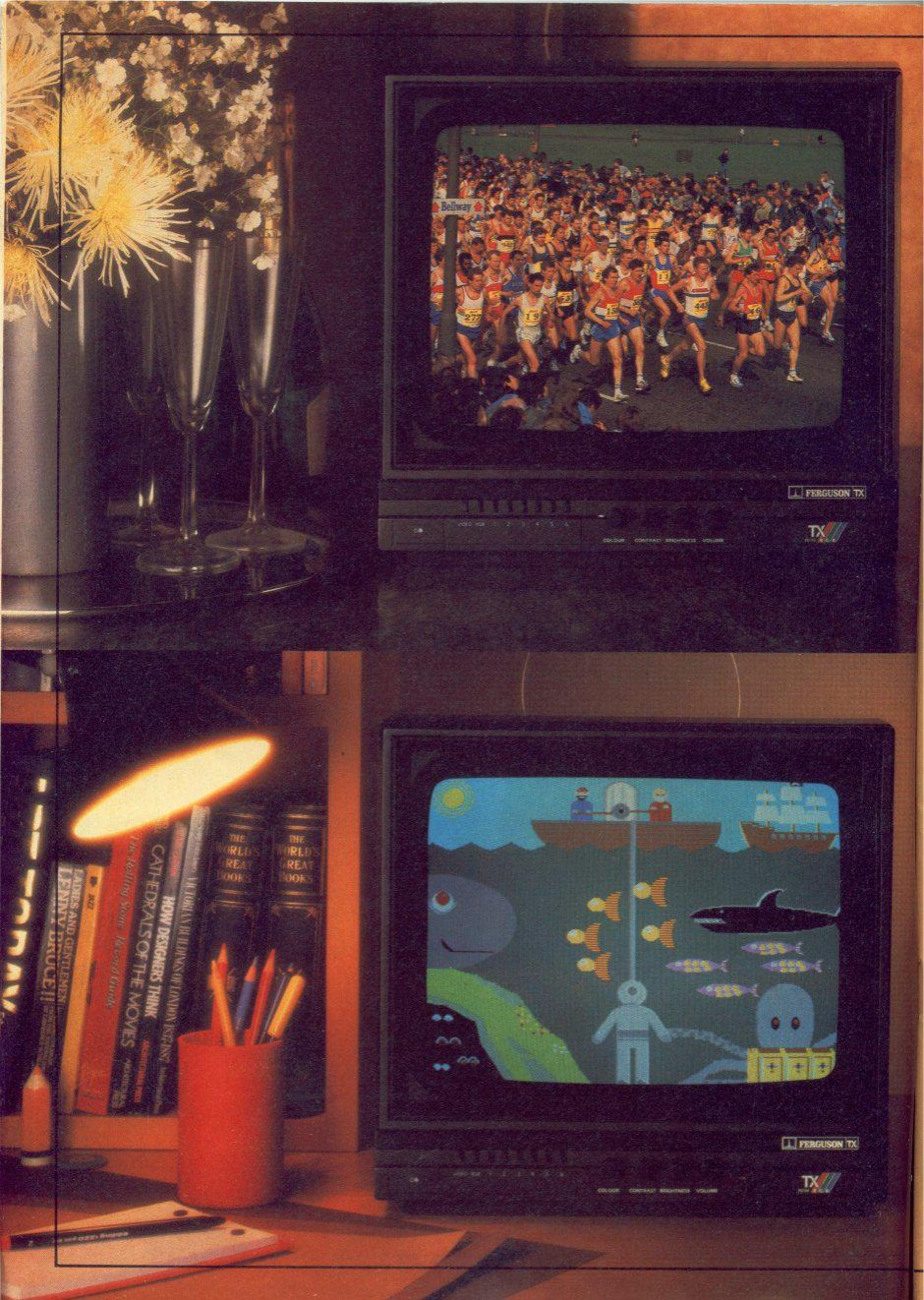
GREAT TRANSFORMERS COMPETITION
Hasbro Dinobots to be won in this great £1000 competition. Plus stacks of Ocean games.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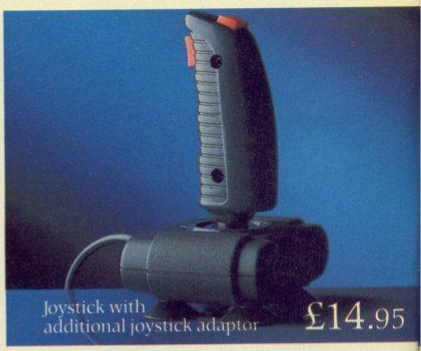

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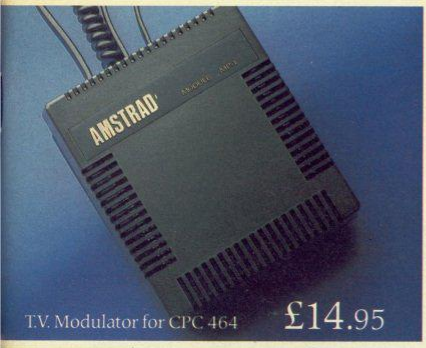

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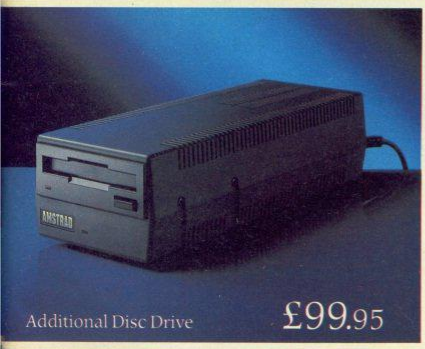

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The CPC 464 comes with built-in datacorder, and the CPC 6128 with built-in disc drive. And both have either a full colour monitor or a green screen.

But Amstrad owners can become even more attached to their computers with the simple addition of the peripherals featured here.

They'll make your Amstrad faster, harder working and more entertaining.

And they're very easy to attach. Simply plug in, and away you go, there's no need for extra interfaces.

You may of course wish to get into some even more serious computing, for which you will need the Amstrad RS 232C specialist interface. This opens the door to modems, networks, and serial printing.

But whichever additions to your Amstrad you care to make you'll find their low prices an additional pleasure.

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The 64k of RAM means you'll have plenty of memory to play with. And there are over 200 Amsoft games, that you can play, many exclusive to Amstrad.

But games are only half the fun on the Amstrad CPC 464. In fact using it can also be quite an education.

The kids can learn spelling and arithmetic with software like Wordhang and Happy Numbers.

Whilst adults will love the way it helps around the house with budgetting and accounts.

Put the 464 to work and it will take care of a number of business-like functions, such as wordprocessing and spreadsheet.

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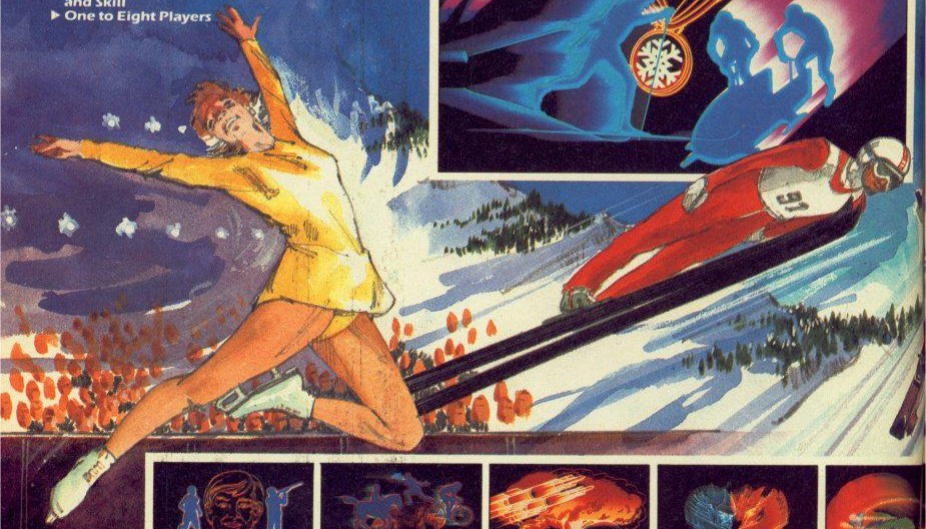

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- Opening and Awards Ceremonies
- 8 different events
- Compete against opponent or computer
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Atari & Commodore 64

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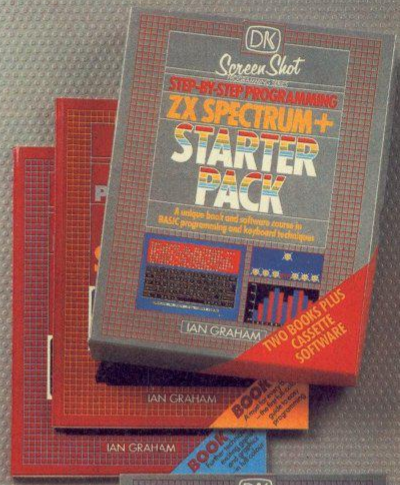
Two powerful packages of personal computing programming techniques made instantly usable by Dorling Kindersley's unique 'Screen Shot' presentation.

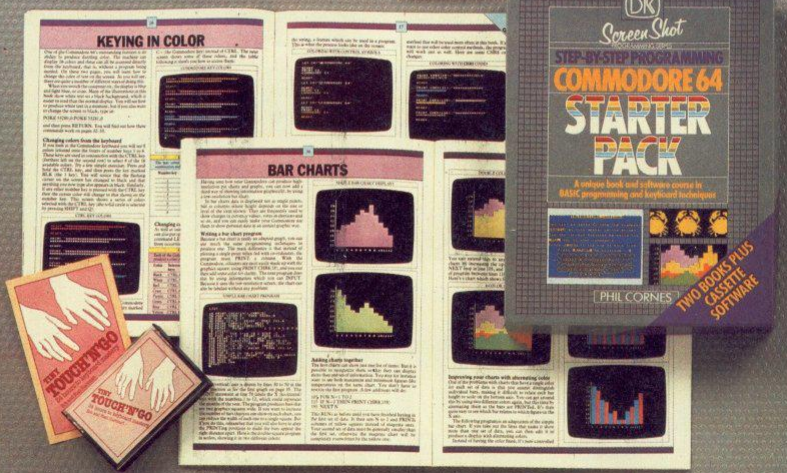
What you see in the pages of the books is what you get on the screen when you follow the step-by-step programming guidance in the text. The crystal-clear illustration is easy-to-follow and guaranteed free from typographic errors.

STARTER PACKS

The Starter Packs for the Commodore 64, ZX Spectrum+ and BBC Micro get you going quickly with BASIC programming.

The accompanying software offers carefully graded exercises leading to rapid keyboard familiarity.





PACKS

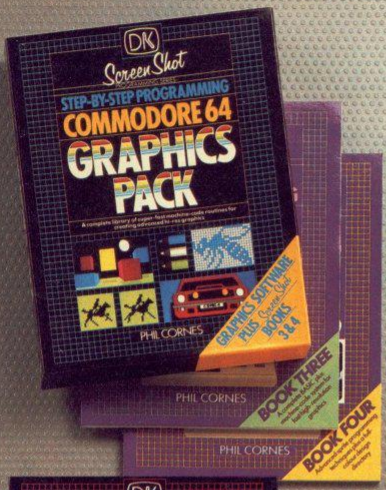
GRAPHICS PACKS

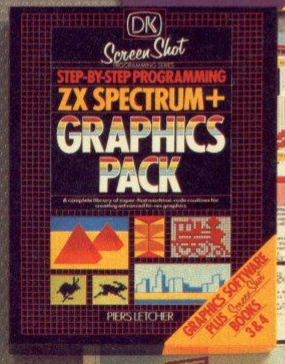
The Graphics Packs for the Commodore 64, ZX Spectrum+ contain a fabulous collection of more than 200 graphic images, each with its machine-code program. The keyboard-controlled graphics editor enables you to create and manipulate the images.

In-pack software contains the complete machine-code library of images, demonstration routines and the full graphics and sprite editor programs.

Each pack contains *two* full-colour Screen Shot programming manuals plus library cased cassette software. Superb value at £15.95 inc VAT for the complete pack.

Available from larger branches of Boots, Menzies, W H Smith and leading bookshops and computer stores. In case of difficulty, write to Dorling Kindersley Publishers Ltd, 1-2 Henrietta Street, Covent Garden, London WC2E 8PS.





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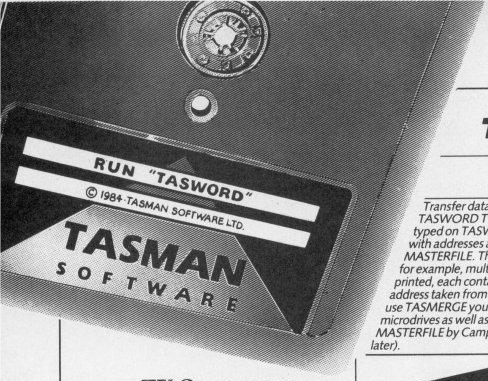


ZX SPECTRUM

TASWORD TWO
THE WORD PROCESSOR

TASWORD TWO for the ZX 48K Spectrum cassette £13.90 microdrive cartridge £15.40

"Without doubt the best utility I have reviewed for the Spectrum"
HOME COMPUTING WEEKLY APRIL 1984

"If you have been looking for a word processor, then look no further" CRASH JUNE 1984

With 64 characters per line on the screen and a host of useful features TASWORD TWO is the ideal word processing package for the Spectrum owner.

TASPRINT
THE STYLE WRITER

TASPRINT for the ZX 48K Spectrum cassette £9.90 microdrive cartridge £11.40

A must for dot matrix printer owners! Print your program output and listings in a choice of five impressive print styles. TASPRINT utilises the graphics capabilities of dot matrix printers to form, with a double pass of the printhead, output in a range of five fonts varying from the futuristic Data-Run to the hand writing simulation of Palace Script. A TASPRINT gives your output originality and style!. The TASPRINT fonts are shown below together with a list of compatible printers.

TASMAN PRINTER
INTERFACE

TASPRINT PRINTER INTERFACE for the ZX Spectrum £39.90
RS232 Cable for ZX Interface 1 £14.50

Plug into your Spectrum and drive any printer fitted with the Centronics standard parallel interface. Supplied complete with ribbon cable and driving software. The user changeable interface software makes it easy to send control codes to your printer using the method so successfully pioneered with TASWORD TWO. The cassette contains fast machine code high resolution full width SCREEN COPY SOFTWARE for Epson, Mannesmann Tally, Shinwa, Star, Tandy Colour Graphic (in colour!) printers. TASCOPY shaded screen copy software for this interface (value £9.90) is INCLUDED in this package.

The TASCOPIES and TASPRINTS drive all Epson compatible eight pin dot-matrix printers e.g.

AMSTRAD DMP2000	NEC PC-80238-N	BROTHER M1009
EPSON FX-80	MANNESMANN TALLY MT-80	BROTHER HR5
EPSON RX-80	STAR DMP501/515/5610	SHINWA CP-80
EPSON MX-80 TYPE III	COSMOS-80	DATAC PANTHER
		DATAC PANTHER II

COMPACTA - bold and heavy, good for emphasis
DATA-RUN - a FUTURISTIC SCRIPT
LECTURA LIGHT - clean and pleasing to read
MEDIAN - a serious business-like script
PALACE SCRIPT - a distinctive flowing font

TASPRINT output shown at less than half size

TASMERGE
THE MAIL MERGER

TASMERGE for the ZX 48K Spectrum cassette £10.90

Transfer data from MASTERFILE to TASWORD TWO! Letters and forms typed on TASWORD TWO can be printed with addresses and data taken from MASTERFILE. The mail merge facility allows, for example, multiple copies of a letter to be printed, each containing a different name and address taken from your MASTERFILE data. To use TASMERGE you must have one or more microdrives as well as TASWORD TWO and MASTERFILE by Campbell Systems (version 9 or later).

ZX SPECTRUM

MSX·EINSTEIN

TASCOPY
THE SCREEN COPIER

TASCOPY for the ZX Spectrum with Interface 1 cassette £9.90 microdrive cartridge £11.40

The Spectrum TASCOPY is for use with the RS232 output on ZX Interface 1. It produces both monochrome (in a choice of two sizes) and large copies in which the different screen colours are printed as different shades. With TASCOPY you can keep a permanent and impressive record of your screen pictures and diagrams. A list of printers supported by TASCOPY is given to the left.

TAS-DIARY
THE ELECTRONIC DIARY

TAS-DIARY for the ZX 48K Spectrum and microdrives. Cassette £9.90

Keep an electronic day-to-day diary on microdrive! TAS-DIARY includes a clock, calender, and a separate screen display for every day of the year. Invaluable for reminders, appointments, and for keeping a record of your day. The data for each month is stored as a separate microdrive file so that your data for a year is only constrained by the microdrive capacity. TAS-DIARY will work for this year, next year, and every year up to 2100! Supplied on cassette for automatic transfer to microdrive.

TASWIDE
THE SCREEN STRETCHER

TASWIDE for the ZX 48K Spectrum cassette £5.50

With this machine code utility you can write your own Basic programs that will, with normal PRINT statements, print onto the screen in the compact lettering used by TASWORD TWO. With TASWIDE you can double the information shown on the screen!

AMSTRAD CPC 464–664–6128

With the exception of TASWORD 6128 all the programs described below run on all of the 464, the 664, and the 6128.

TASWORD 464
THE WORD PROCESSOR

TASWORD 464 for the Amstrad CPC 464, 664, and 6128 cassette £19.95

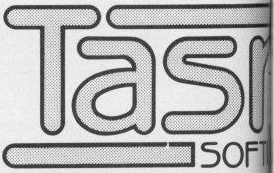
"There is no better justification for buying a 464 than this program"
POPULAR COMPUTING WEEKLY NOVEMBER 1984

TAS-SPELL
THE SPELLING CHECKER

TAS-SPELL for the Amstrad CPC 464 and 664 running TASWORD 464-D and for the CPC 6128 running TASWORD 6128 disc £16.50

TAS-SPELL checks the spelling of TASWORD 464-D and TASWORD 6128 text files. TAS-SPELL has a dictionary of well over twenty thousand words which are compared with the words in your text file. You can add your own specialised words to the TAS-SPELL dictionary. Please note that TAS-SPELL will only work with TASWORD 464-D and TASWORD 6128.

Available from good



Springfield House, Hyde Terrac

TASWORD 464-D
THE WORD PROCESSOR

TASWORD 464-D for the Amstrad CPC 464, 664, and 6128 disc £24.95

This is the new TASWORD especially developed to utilise the capabilities of the Amstrad disc drives. A major new feature is a powerful mail merge facility. TASWORD 464-D will only run on, and is only supplied on, disc.

TASWORD 6128
THE WORD PROCESSOR

TASWORD 6128 for the Amstrad CPC 6128 disc £24.95

TASWORD 6128 utilises the additional 64K of memory in the CPC 6128. This gives text files that are over 60K long. TASWORD 6128 includes mail merge and all the other features of TASWORD 464-D. With a new notepad mode and other additional capabilities TASWORD 6128 is the most powerful of the TASWORDS.

TASPRINT 464
THE STYLE WRITER

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TASCOPY QL adds new commands to QL Superbasic. Execute these commands to print a shaded copy of the screen. Print the entire screen or just a specified window. TASCOPY QL also produces large "poster size" screen copies on more than one sheet of paper which can be cut and joined to make the poster.

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THE STYLE WRITER

TASPRINT QL for the Sinclair QL microdrive cartridge £19.95

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AMSTRAD · QL · COMMODORE

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Adds two new Basic commands to give both a standard shaded screen copy as well as a "poster size" copy which is printed onto two or four sheets which can be cut and joined to make the poster. Drives the Amstrad DMP-1 in addition to the printers listed on the opposite page.

TATUNG EINSTEIN

TASWORD EINSTEIN
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A sixty four character line display and the ability to hold over five hundred lines of text at any time are just some of the features of this TASWORD for the Tatung Einstein. Full interaction with the disc system – e.g. TASWORD detects the presence of added drives and allows their use.

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Edit...

A word from the Editor

EUREKA: MICROS SANS FRONTIERES

ALMOST EXACTLY FOUR years to the day that the 32K BBC model B first beeped to life, Acorn has stopped manufacturing it for the U.K. market. In contrast the excitement the machine caused when it first appeared, it has been quietly slipped out of production with Acorn reluctant to admit the fact.

Of course you'll still be able to pick up a 128K BBC Plus or the 64K Plus offered with a £30 64K upgrade.

Despite its £400 price tag, and thanks to its high performance, solid construction and the vitally important "BBC" badge, the model B became the standard computer for education. It has also kept thousands of home and professional users happy for years. Obviously the larger memory BBCs will try to satisfy those markets for the immediate future, but what is Acorn planning to do to maintain its dominance of the educational scene?

The answer may lie in Europe's Eureka project. It's difficult to be more definite than that because even the European technology ministers concerned don't seem to be too sure what Eureka is.

What is clear is that it's going to be some kind of scheme for high-technology cooperation. And one of the 10 projects to get the OK from the foreign and technology ministers assembled in Hanover recently is Acorn's venture with Olivetti and French electronics giant Thomson. The aim of their scheme is to develop a European standard for educational computers.

The French started the Eureka ball rolling when President Mitterrand proposed the scheme as a European antidote to President Reagan's Star Wars project.

As we reported in our October edition Eureka could lead to a joint European standard for "home information and entertainment" — the Eurohome project proposed by Britiain's Department of Trade and Industry. Let's just hope that if it does come about it proves more of a threat to U.S. and Japanese markets than MSX computers.

Starring

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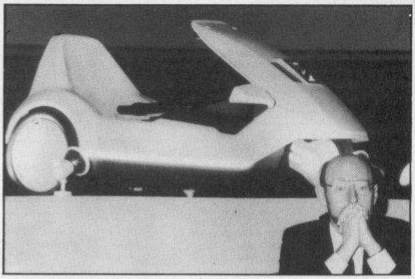

C5 and you've seen the lot

Just as the "official" biography of Sir Clive arrives — The Sinclair Story by Rodney Dale — the great man's tricycle company has crashed again. The holding company, TPD, which took over from Sinclair Vehicles has gone into liquidation with debts of £1 million to creditors other than Sinclair. He has lost £8 million on the C5 and other electric vehicle projects but will get first grab at the £500,000 assets of TPD.

Rodney Dale was given access to company archives when he was writing his book and the result is that he has become closely involved with his subject. He spends much of the book on Sir Clive's early life in the electronics business and the flat screen television. There is a little analysis of why someone who could single-handedly create a market for home computers in this country should repeatedly be involved in a series of marketing and manufacturing disasters with digital watches, calculators, flat screen tellies and now the C5.

Dale confesses to being surprised at the failure of the C5. His memories of the launch day back in January at Alexander Palace are very different from those who insisted on taking the trikes out of the heated hall into the real world they were supposed to be designed for. The danger and unreliability of the C5 "bobsleigh" were immediately apparent as journalists found themselves hurtling out of control down ice slopes, almost disappearing under the wheels of lorries and having to pedal back up the hill after their motors overheated or batteries failed. A new and decidedly unnoficial biography is due out soon.

New Einstein is it a Bohr?

Tatung admits that it is working on new models for next year but insists that new Z-80 machines will be "downwards compatible" with the Einstein, the 64K micro which with colour monitor and disc drive costs £400 not £500 as we said last month. New machines will have 80 column display, stereo sound and a choice of 128, 256 or 512K memory.

Meanwhile new products on the way for the Einstein include a £30 music package and a similarly priced transformer box which will allow the Einstein to run Spectrum programs.

Hard News

NO NEED FOR 16 BITS

Acorn is putting a brave face on its absence from the High Streets this Christmas for the first time in four years. You may find some Electrons in Dixons — part of the job lot picked up in the Summer but everyone has given up on selling the BBC Micro.

Acorn now admits that the 32K BBC B has been discontinued but against the odds it still insists on trying to sell the BBC 128 without disc drive or monitor for £500. It seems a shame that Acorn has opted out just when companies like AMS with the AMS mouse are extending the frontiers of the BBC to make it a 16-bit WIMP look-a-like.

AMS has introduced a £50 Pagemaker program which allows you to compose a complete page of a school newspaper for instance on a screen including graphics and photographs. There are 16 different founts which give a limited but interesting variation in typeface. The typesetting is crude as you would expect — it justifies but not proportionately — but effective.

Digitised pictures can be loaded and then altered on screen. Another new package for the £40 AMX mouse is the £50 Super Rom/Art program which gives the AMX mouse pull-down menus overlapping colour windows, patterns and an icon in all modes.

'Amstrad piracy' — both sides claim a win

Selling tape copying equipment not unlawful

Who is winning the piracy battle between Amstrad and the British Phonographic Institute depends which paper you read. The problem for BPI which fights copyright evasion was that the double speed tape-to-tape machines sold by Amstrad were being used to copy commercial music — and computer — cassettes. Amstrad sought a declaration that they were legally in the clear but the High Court refused.

Amstrad fails to win audio approval

When Amstrad appealed at the end of October *The Times* ran its law report under the headline "selling tape copying equipment not unlawful" while *The Guardian* went for "Amstrad fails to win audio approval". The truth seems to be that the Appeals Court ruled that selling products that could be used to infringe copyright was not illegal as such but that promotional material which encouraged breaking of copyrights could causes the crime incitement to break the law.

DIARY

Bruce's friend Sir Keith Joseph is thinking about closing Keele University which is sad. Bruce you may remember last month argued that Joseph ought to be promoting serious software which is just what the Department of Psychology, at Keele is doing as part of a three year project financed by Rowntree Trust to produced software for mentally handicapped people. The first arcade game designed for the handicapped, Mr Ugh, has already been developed and if you want to find out more about what the Keele Psychologists are up to contact John Hegarty, University of Keele, Keele, Staffordshire.

Acorn's enthusiasm for £1,000,000 order for the BBC from Canada is understandable but it is a small return on the £8 million or so which the company sank into the North American market and which directly led to its collapse and takeover by Olivetti.

Tatung is still smarting from the exposure of its no smiling

(continued on page 23)

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Soft News

(continued from page 21)

or laughing policy at the Bridgnorth factory where Einstein micros are made. Now the company is saying that the Taiwanese management only meant the workforce to have a serious attitude when using dangerous machinery.

Our very own Bruce Everiss finds himself in hospital to have an overgrown pimple removed from his face. I asked around the office for suggestions for a computer game to send to keep him happy while he is in. "Wetzone" suggests one cynic "Superhuey" is another idea but most vote for "Way of the Exploding Cyst".

British Telecom's MUD may still be glorious but it is certainly going to be late. The Multi-User Dungeons were going to be officially launched at The London Dungeon — where else? — on November 5 but the blue touch paper is still smouldering because BT cannot find enough spare computer capacity at the moment. The Great MUD Challenge has now been delayed till the New Year.

The people next door are away overnight. Their cat jumps on to their television — as cats are wont to do — which is connected to the computer which is connected to a printer and a disc drive and a modem. Ever careful your neighbours have bought the Product Innovation Spider alarm which is like an octopus with sensitive tentacles that has lots three of its legs and so can safeguard a home computer system from theft. The cat meanwhile starts playing with the wire unaware that "any slight movement of the device will sound the alarm". Result — one scaredy cat and a sleepless night for you as PI reckons that the Spider will let off "an ear-piercing 98 decibel scream" for two hours.

Elsie Dee

U.S. GOLD LATEST

Accolade Inc is the newest bright star in the US software firmament. Founded by Alan Miller and Bob Whitehead — both former Atari and Activision pioneers — the company aims to produce high-quality graphics, lifelike games and generally knock your socks off. Thanks to US Gold, the first of these apparently revolutionary programs Hardball for the CBM-64 will be released in the UK in January 1986.

Billed as the most realistic home baseball game ever, it has large lifelike players and three-dimension field views.

US Gold puritans may run a light pencil through some parts of Accolades's raunchy Law of the West, a very funny text-and-graphics adventure.

The third prong of the Accolade assault is PSI-5 — an Elitesque space trade'n zap.

Little People

Many people faced with inexplicable programming problems blame the difficulties not on their own fallibility or obscure operating system bugs but on "little people" living in the machine.

Activision is exploring the widespread belief in Gremlins with its tacky Little Computer People Discovery kit on the Commodore 64. As you would expect this is just a simple game based around a 2½ storey house. Each of the characters is different but according to Activision's Hugh Rees Parnell — who we are assured is real and not a figment of our imaginations — "they share common attibutes such as the need for care and affection, a remarkable aptitude for playing games, the ability to communicate and a love of music."

Activision obviously hopes that Little Computer People will be this year's Cabbage Patch Kids or Pet Rocks. They are giving away deeds of ownership with every hit sold.

QL draw

Impressed by the graphics on Psion's QL Chess? You won't be once you have Psion's Q Draw which allows you to create images using Psion's in-house graphics program.

For £15 Q Draw includes a library of useful shapes and allows you to use "pens" of different thickness on screen. Back with Chess Psion claims that the algorithm their program is based on — written by Richard Lang — is still world champion. But Kasparov need not worry yet. Lang's algorithm can still be beaten by good club players let alone Grandmasters.

Fun house

Ozisoft does not sound like a real name — even for an Australian software house, but CRL claims to have brought Journey, an £8 treasure-hunting game for the Commodore 64, from Ozisoft. Journey features music based on Madness's House of Fun, multi-directional scrolling and hundreds of location.

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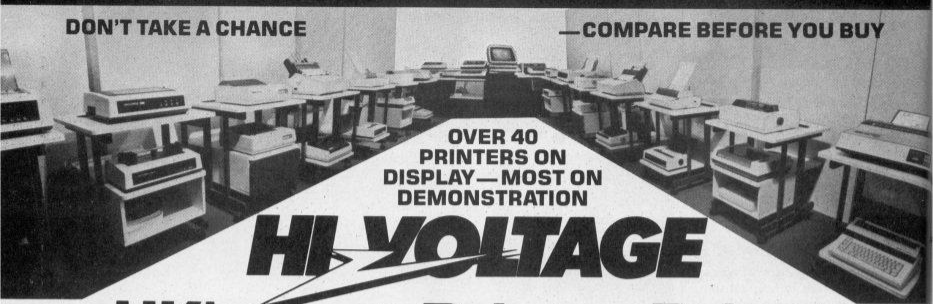

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And don't forget Memotech's attempts to rid the shortage of software by creating — an industry first — the Speculator Rompak which allows a large base of new Spectrum hits to run on the MTX machines.

The tech. spec. of the MTX + it's new prices (MTX500 — £79, MTX512 — £130, and RS128 with twin RS232 — £249 makes it worth a mention.

Avid MTX user,
Lancashire.

Dear Jeff Minter,

Whenever you appear at exhibitions you are surrounded by throngs of acolytes and groupies. They are easily recognisable by their sixties Haight Asbury appearance and by recurrent strange animal motifs. To be quite blunt you are the biggest cult in the micro industry. Now you have a new fan. Me. And I don't even like your games.

While it is fair to say that you know how to program, it is also fair to say that you couldn't market your way out of a wet paper bag. It must be infuriating to see inferior products to yours selling in much larger volumes, cult or no cult. Ariolasoft, on the other hand, probably think a stack pointer is part of a fork lift truck. This hasn't stopped them marketing themselves to the top of the software house tree in less time than it takes to format a Sinclair Microdrive cartridge.

You relationship with Ariolasoft is one of the most sensible events this industry has seen for some time. Adam Smith's divisions of labour proven once again. Both parties benefitting from the other's abilities. True synergy where the whole is greater than the sum of the constituent parts. It is this that has made me a fan.

The Llamasoft/Ariolasoft honeymoon epitomises a trend. Success has increasingly come to those who know what they are. Either programmers or marketeers. Those who try both are a lot less successful. Jack of all trades and master of none. Many who have tried to do both are, unfortunately and somewhat inevitably, no longer with us. Some, luckily, still are. These are the people who should follow your example in order to survive, never mind succeed. Prime among these people are Ultimate. If they wish to continue as a viable entity they have to decide what they are.

Tim Stamper and his gorgeous sister Louise have been the major games software trendsetters. They have produced more influential products than any other software house. Yet their sales, large though they may have been, have never reflected the true merit of their products. Like you they have seen inferior products to theirs sell in larger volumes. Like you their weakness is not in the programming but in the marketing. They make simple mistakes like putting insufficient perceived value into their packaging, making them the most pirated out of all the software houses. It is about time they realised what they are and acted accordingly.

For a small fee I would be only to glad to put Ultimate in touch with the company best suited to market their products.

Bruce Everiss

Bruce Everiss.

IN TOUCH

How to write for Your Computer

We called this magazine *Your Computer* precisely because we welcome you views, tips and hints and even your criticisms of machines and software in general. Here's how you go about getting you name into print. Your article should be typed, double-spaced, on A4 paper. A sheet would help. Don't forget to tell us which machine it runs on. With programs please include a cassette or disc and some indication of how long it is. Please put what machine it's for on the envelope. Don't forget full instructions to us how to load and list your program and how to enter it for the readers.

The article must be submitted exclusively to *Your Computer*. We pay £35 per published page — that's as it appears in the magazine and includes illustrations.

Telsoft

Telsoft is *Your Computer's* software downloading service. Any program for the Spectrum or the BBC and the Commodore which has a telephone symbol next to it is available on the service. Both 1200 and 300 baud speeds are catered for. For more details call Colchester (0206) 8068. No more lonely nights typing in hex.

Message service

You can get messages to us in two ways. Either use the Prestel Telex Link to 892084 BISPRES G or you can use our very own modem, day or night on 01-661 8978. The modem is V21, 300 baud, even parity, 10 bits per character. You simply transmit in upper case "YRC" — our address code, and wait for the acceptance code "+ + + STF GO". Then off you go. Don't forget to tell us who it's for. Sign off with "NNNN" — again in upper case.

XMAS MICRO

I'm not often moved to writing but after reading November's *Your Computer*. I feel I must point out a few errors in Lee Paddon's article about possible micros for your Christmas stocking. For in that article he states that the Enterprise has very little software and most of them are poor conversions.

While at the time of that article being written there might not have been many available — this is something that has since changed. Saying that they are mainly poor conversions could not be further from the truth. In fact 95 per cent surpass the originals in both graphics, sound and speed. If you are wondering why so many of the

(continued on page 27)

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To get £3 off 'Now Games' and £5 off games like 'Falcon Patrol II', and 'The Biz', just detach the voucher from the cover of this issue. Together with your voucher from the November issue, you'll then be entitled to...

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Falcon Patrol II—Spectrum	The Biz—Spectrum	Falcon Patrol II—CBM 64	Sorcery—CBM 64

Normal prices for BBC/CBM 64 product is £8.95 except for Jungle Jive and Falcon Patrol £2.99.
Spectrum product is £6.95. The following games £2.00 off at £6.95, or £5.95 each if something else purchased:
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Virgin Games/Your Computer Special Offer, 2-4 Vernon Yard, Portobello Road, London W11 2DX

This offer closes on January 31, 1986.

Your letters

(continued from page 25)

titles are conversions, it is because they are so easy to transfer.

For example, the screen can be made to simulate the Spectrum screen right down to being at the same address and pixel layout. Even attribute clashing occurs if a straight dump version is made. Another point is Enterprise has never claimed that it can run MSDOS. All it has ever claimed is MSDOS file compatibility, that means reading and writing MSDOS files and not running MSDOS programs. Any claim that it will do so is a complete fallacy.

T J Box,
Independent Enterprise
User Group

DRAWER BUG

Thank you for publishing my 'Drawer' program in the November issue of *Your Computer*. I have, unfortunately recently discovered a bug in the program which causes use of the "Text" mode to corrupt the long-term store. Corrections are as follows:

Load the code then;
POKE 28908,191
POKE 29221,191
POKE 29222,6
POKE 29235,191 then SAVE "DRAWCODE" CODE 25000,5512.

This applies only to the program as you publish it, not to the tapes which have been bought directly from myself. Apologies for the inconvenience.

P A Rhodes,
Luton,
Bedfordshire

REVIEW VIEW

I would like to make a few comments which relate to Colin Grant's letter in the September issue.

The Spectrum Microdrives are excellent and do compare with some disc drives in performance. I have never lost any data or program kept on them and a recent development project that required me to use them just re-inforced how good they are.

The original QL review stated that the hardware was the best value yet, but I was very concerned about the software. The QL hardware has been further improved and is perfectly satisfactory, the software also still has one fundamental fault.

The saving and loading times of Basic programs are very poor when compared with the Spectrum, there should have been a routine developed by Sinclair and put in later Roms to enable saving and loading at Spectrum speeds. Although QL floppy discs are quicker, they still do not compare with the Spectrum speeds which is a great pity as virtually all the QL problems are related to this one fault.

It is helpful to see a response to the reviews, good or bad, as it enables me to continuously update the criteria I use to evaluate the machines, and it informs me of any blind spots or prejudices that I might have.

Finally, remember it is only my opinion, based on a standard set of tests that I have developed and apply to each machine reviewed. The object of the exercise is to inform the reader of any shortcomings, extra facilities and of the perceived value for money. On a low cost machine, the fact that their are omissions is not surprising and should be taken in context.

K D Peel.

AMSTRAD TALE

Just thought I would relate a tale of one computer user who is not only happy with the machine he bought but who is over the moon with the after sales back-up which is available. The machine is the Amstrad CPC 6128.

I was one of the original ZX81 owners (well I was looking for something to run my power station for me).

Even as I type this, I recall with horror the days I spent trying to get through to Sinclair's one, permanently engaged telephone line, only to be told when successful that I had got the wrong department and could I try another number...four days later I finally got through to the right number only to be told that there was nothing wrong with the Rom — perhaps I should see a psychiatrist instead — I had a perverse satisfaction when some time later they had to admit that there was a fault in the Rom and had to replace half a billion or so that were in circulation already at their own expense. Never mind, after learning the hard way, I vowed that I would postpone upgrading to a better machine until I was certain it would be the right one.

The Spectrum passed me by as did the QL, the Acorn, the Enterprise (with the gestation period of an elephant) I congratulated my cynicism when I saw the mess the QL got into, (they only had to ask and I would have told them beforehand).

The CPC 664 arrived, oh no, could I resist...just, I bit the bullet and watied. The CPC 6128 arrived and I knew this was the one I had saved myself for all those years. It was everything I wanted and more. I couldn't believe the price, the speed of the Basic, the manual....the everything. On top of this when I had a slight problem with running a program designed for the 464 — not a software compatability problem but due to a rearranged keyboard configuration on the 6128 — I phoned up Amsoft, and got through first time, they put me on to Cliff Lawson one of their boffins.

He said "Oh yes there *is* a problem, I'll sort it out tonight at home and phone you with the solution tommorrow". And guess what....HE DID!

Steve Williams,
Twikenham,
Middlesex.

COMPUTER MAGIC-THE FACTS

I would like to set the record straight, with reference to an article on page 20 of the November issue of YC.

First, I would like it known that I am not in competition with the Magic Circle and/or with other members of the magic fraternity — of which I am a member — concerning "Computer Magic". Though it is true that is known that I am an exponent of this form of entertainment.

I would also like to point out that the name Sardi's is not a software house. In fact it is the name of my representatives as a professional entertainer, and have no links with the computer magic aspect as was reported in *Your Computer*.

The article in question, seems to have been written without all the facts, that were an offer to the publishers. I feel strongley that it was also detrimental in any respects to both Sardi's and myself.

David Hambly,
Redbridge,
Essex

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CHALLENGER

▶Opus ● Disc drive ● BBC ● £249.95

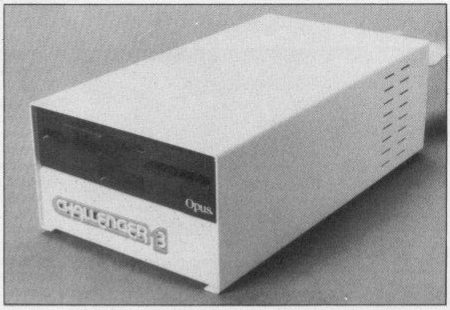
A Ram disc is a popular facility in disc operating systems. This unit takes the process a stage further by giving you 256 Ram contained within the drive unit which is configured as an extra disc drive. For an extra £70 you can have a further 256K Ram disc.

You also get Opus's highly regarded DDOS. This features single and double density storage, a host of extra commands, an expanded directory arranged as a series of volumes, and it doesn't tie up any system Ram (page is set at &E00).

The most startling use of a Ram disc this size is in programs which use random access files during the execution of a program. A prime example of this is Viewstore, a new data base from Acornsoft. Using Challenger, you will not notice the program updating the disc contents. Then when you've finished, you simply backup the Ram disc to the floppy disc and turn off.

Another application is for displaying large amounts of graphic data. The pictures can be pulled off disc virtually instantly. In strict performance terms, use of the Ram disc is around 20 times faster than most floppies.

Perhaps the only cloud on the horizon is software compatiability. Some protected programs won't load using Challenger. Challenger is available from computer dealers or direct from Opus on Redhill 65080.



● Challenger disc drive from Opus

HS-S1

▶Amstrad ● Serial Interface ● Honeysoft Ltd. ● £29.95

Honeysoft is a small company specialising in Amstrad add-ons. Its serial interface allows the Amstrad to be connected with serial printers or modems.

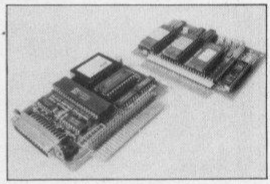
Two channels are supported over the usual range of baud rates. Word length and parity can also be set. One of the channels can use split baud rates and hardware handshaking, the other uses purely on/off protocols. The board is compact and well made with a full 25 way connector and an extension socket for further add-ons.

You can control the board under CP/M or by using Basic commands available on Rom, disc or cassette.

Honeysoft intend to support this board with Viewdata and Bulletin board software. Only preview copies were available with the review sample, but hopefully the final version should be available later this month. The pre-release version was easy to use, with most commands being accessed by menus overlaid on the page currently displayed. Two screen modes are available, mode 0 uses all eight colours, but the text is rather compressed, but still legible. Mode 1 has the normal character set, but the colours have to be fudged by stipling.

Other facilities planned will be familiar to Commstar owners, with pages held in memory, screen dumps of either text or graphics, saving and loading pages, tagging pages and clock. The system will be compatible with the new Micronet downloading service.

Again this software will be available on Rom, disc or cassette for around £20. It is hoped that future upgrades will include colour screen dumps and off-line mailbox editing. If all that is promised is delivered, then this looks like a very promising product indeed. The serial board is also compatible with Amstrad's own interface.



● Honeysoft's serial interface, the HS-S1

The prices quoted for the Arnor products in last month's issue were incorrect. The Rom card is £15.95. Utopia is £29.95 and Protext is £39.95 on Rom. These programs are also available on disc and cassette.

LTR-1

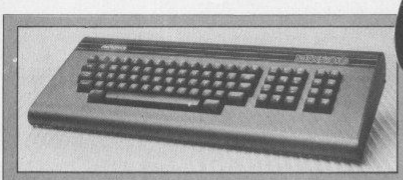
▶Spectrum ● Printer ● Saga Systems ● £149.90

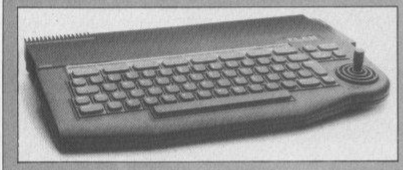
Printers at this end of the market are generally thermal printers using expensive paper, or rather nasty dot matrix jobs. This product represents a notable first giving real letter quality. printing for under £200.

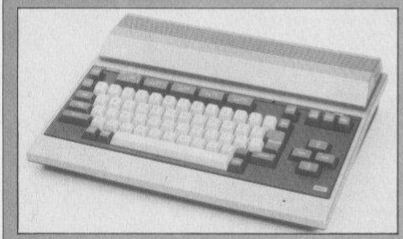
It takes plain A4 paper (but won't take continuous forms). The head consists of five character wheels spinning past the paper. The noise level is about the same as a daisy wheel, with bi-directional printing giving a print speed of around 10 cps.

The printer has a standard Centronics interface, and can also accept serial data through unused pins on the parallel port.

Christmas







From the top: Memotch 500; Atari 800XL; Enterprise; JVC MSX; Spectrum +. Opposite: Canon V-20 MSX; BBC Electron.

Simon Beesley looks a cheaper buy for Christmas.

Computer prices fall every year but this Christmas brings some really outstanding bargains. In some cases home computers are being sold for a half or even a third of their original price. For example, in January 1984 the Atari 800XL cost around £250. On top of this you needed to fork out £50 for an Atari cassette recorder. Now you can buy the machine for £100 with a cassette recorder, joystick and 10 programs thrown in for good measure.

£100, in fact, will buy you a micro with 64K Ram, colour, 3 channel sound, and a graphics resolution of at least 256 by 192. To put this price in perspective consider that in 1981 the 16K ZX81 — a machine with a bald keyboard and chunky black and white graphics — was rated a bargain at £120.

All the micros listed cost less than £180. Where the machine is sold in a package which includes a cassette recorder and joystick, the all-in price has been given. Usually it is substantially cheaper, than buying each item seperately.

Computers in this price bracket are suitable for the first-time buyer who wants to use a computer mainly for recreation. If you have a more serious application in mind you would do better to look at the micros covered in last month's guide. It is certainly possible to use a Spectrum for wordprocessing or keeping your accounts; but to do this you need to add a printer and a disc drive, along with appropriate interfaces.

Deciding which computer to buy partly depends on what you intend to do with it. People tend to justify their purchase by telling themselves that they will learn to program or that it will be useful for Junior's education. A few months later nine out of ten owners use their computer solely for playing games on. Fair enough, but it is unfortunate if there is not much software available for your machine. It may be a commonplace to say that a computer is only as good as the software that runs on it, but it is worth repeating nonetheless.

If you are interested in programming, a good keyboard and a fast, extensive version of Basic are features to look out for. Even programmers, though, need commercial software in the form of programming utlities, assemblers or other languages. So the question of software availability is important here, too.

The specifications of the 11 machines under £180 are given in the table. There is also a brief comment on each micro, which summarises its pros and cons. We have not thought it necessary to provide a list of peripherals. Printers, disc drives, modems, light pens, speech units, and other add-ons, are available for most of these machines.

Atari 800XL: Possibly the best value of all, for its robust keyboard, superior graphics, and high quality games software. Not as many news titles are released for the Atari as for the CBM-64 or Spectrum. But since it is compatible with earlier models there is a large range of programs already available.

Atari 130XE: More memory for your money than any other micro in this price range. Memory aside, it is almost the same as the 800XL with which it is software compatible. And as the processor can only handle 64K at a time the extra memory is only a minor improvement. It is unlikey that much commercial software will take advantage of it.

Commodore 16: Why Commodore chose to introduce a new micro which could not run CBM-64 software is a total mystery. Now superseded by the CBM 128, the CBM-16 will soon sink into oblivion.,

Commodore 64: Top of the table as far as games software is concerned. Only the Spectrum can boast as many titles, but the CBM-64's superb sound chip and superior graphics give it the edge quality-wise. Let down by a poor version of Basic.

Commodore Plus 4: Usefully includes four business programs, themselves not really

buys

powerful enough to make the Plus 4 a practical proposition as a business micro. It has received almost no support from third party manufacturers and software houses — and as a games machine it is a non-starter.

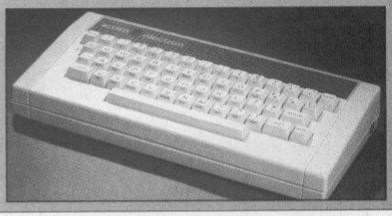
Electron: A crippled version of the BBC micro, the Electron suffers from insufficient memory and a shortage of ports. Its major asset is BBC Basic, although it is too slow to run most BBC software.

Enterprise: Although technically superior, the Enterprise was lauched too late in the day to have much success. Limited software.

Spectrum: Tacky keyboard, poor construction, and feeble sound facility. Yet the Spectrum's popularity has ensured that a massive amount of software has been written for it. A good machine to get started on.

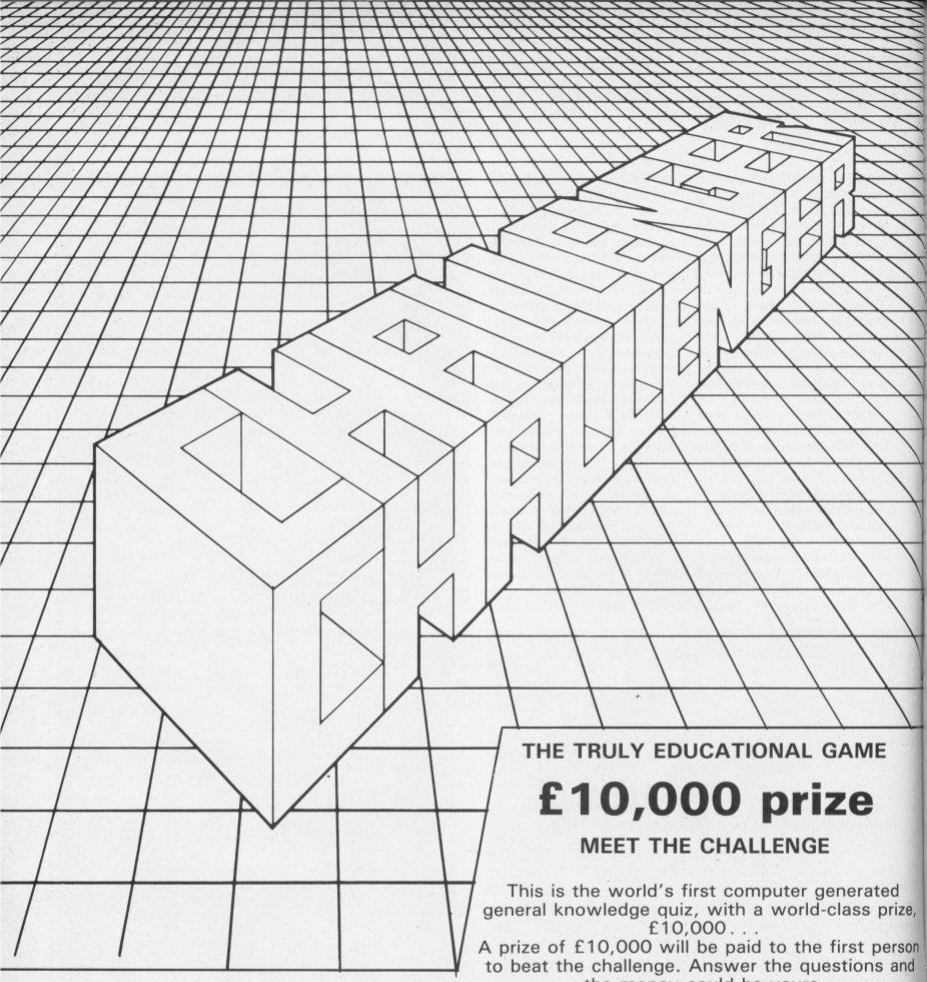
Memotech: Both the 500 and 512 are well made machines with remakably high specifications for their price. Unfortunately they have not had the success they deserve, and as a result only a limited amount of software is available. Adding a disc drive to the 512 solves the problem by allowing you to run CP/M software, although most of it for business users only. If you are not interested in games the Memotech is one to consider.

MSX: Cannon, Toshiba, JVC, Sony, Mitsubishi, Yamaha, Spectravideo, in Rom, but the programs Goldstar, Sanyo and Panasonic, all make computers that conform to the MSX standard. The idea behind it is that by building computers to the same specification they can all run the same software. Too bad that the specification settled for was rather a dull one.



Cheap Micros

Machine	Price	Memory & processor	Graphics	Test	Colours	Sound	Ports	Keyboard	Software	Other Features
Atari 800XL	£9.99 inc joystick + cassette +	64K RAM 24K ROM 6502 1.8MHs	320 x 192 15 other modes	40 x 24 20 x 24 20 x 12	16 5 5	4 voices envelopes	Joystick, Serial, expansion composite video	Full Travel 4 funcional keys	Large range of games, some business and educational	Sprites, Cartridge slot
Atari 130XE	£119.90	128K RAM 24K ROM 6502 1.8MHz	320 x 19 10 other modes	240 x 24 4 other modes	128	4 voices envelopes	Joystick, serial, expansion, compsite video	Full travel 5 function keys	Runs 800XL software	Sprites
Commodore 16	£69.99 inc cassette + 4 programs	16K RAM 16K ROM 7501 1MHz	320 x 200	40 x 25	16	2 voices	Joystick, serial, expansion, user, composite video	Full travel 4 function keys	Very little not compatible with CBM-64	
Commodore 64	£199.99 inc cassette	64K RAM 16K ROM 6510 1MHz	320 x 200	40 x 25	16	4 voices envelopes	Joystick, Serial, expansion, user, composite video	Full travel 4 function keys	vast range, mainly games	Sprites
Commodre Plus 4	£99.99 inc cassette +	64K RAm 48K ROM	3200 x 200	40 x 25	16	2	Joystic, serial, expansion, user,	Full travel 4 function keys to improve	Not much at present, unlikely spreadsheet	Built-in wordprocessor, database and graph programs
Electron	£99.99 inc cassette + 5 programs	32K RAM 32K ROM 6502 2MHz	640 x 256 32 x 256 160 x 256	80 x 32 40 x 32 20 x 32	1 4 16	1 voice envelopes	Expansion	Full travel	Games and educational	Built-in assembler
Enterprise 64	£180	64K RAM 96K ROM Z80A 4MHz	675 x 512 3 other modes	84 x 56 40 x 24	2 up to 256	4 voices envelopes stereo	Expansion, RS232 Centronics, Joystick, RGB	Membrane type 16 function keys	Not much, may improve	Built-in wordprocessor, stereo output
Memotech 500	£79	48K RAM 24K ROM Z80A 4MHz	256 x 192	40 x 24	16	4 voices envelopes	Centronics, RS232 joystick, RGB expansion	Full travel 8 function keys numeric keypad	Some games and business	Built-in assembler, assembler, Logo, Noddy
Memotech 512	£130	80K RAM 24K ROM Z80A 4Mhz	256 x 192	40 x 24	16	4 voices envelopes	Centronics, RS232 joystick, expansion	Full travel 8 function keys, numeric key pad	Some games, business, and CP/M option	Built-in assembler, Noddy, Logo
MSX	£99.99 upwards	64K RAM 32K RAM Z80A 4MHz	256 x 192	40 x 24	16	3 voices	Centronics joysticks	Full travel 10 function keys	Not a great deal at present may improve	Cartridge slot
Spectrum Plus	£139.99 inc Joystick + cassette + 10 programs	48K RAM 16K RAM Z80 3.5MHz	256 x 176	32 x 24	8	Beep				



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The charts

TOP 30 OVERALL CHART

1	MONTY ON THE RUN	GREMLIN GRAPHICS
2	WAY OF THE EXPLODING FIST	MELBOURNE HOUSE
3	FRANK BRUNO'S BOXING	ELITE
4	IMPOSSIBLE MISSION	EPYX/US GOLD
5	FORMULA ONE SIMULATOR	MASTERTRONIC
6	FINDERS KEEPERS	MASTERTRONIC
7	DALEY THOMPSONS SUPER TEST	OCEAN
8	ACTION BIKER	MASTERTRONIC
9	STARQUAKE	BUBBLE BUS
10	HACKER	ACTIVISION
11	FIGHTING WARRIOR	MELBOURNE HOUSE
12	BMX RACERS	MASTERTRONIC
13	WHO DARES WINS 2	ALLIGATA
14	GRAHAM GOOCH TEST CRICKET	AUDIOGENIC
15	FAIRLIGHT	THE EDGE
16	CHILLER	MASTERTRONIC
17	BEACH HEAD	ACCESS/US GOLD
18	BORED OF THE RINGS	SILVERSOFT
19	NONTERRAQUEOUS	MASTERTRONIC
20	WORLD SERIES BASKETBALL	IMAGINE
21	NOW GAMES	VIRGIN
22	MATCH DAY	OCEAN
23	HYPERSPORTS	IMAGINE
24	VEGAS JACKPOT	MASTERTONIC
25	SUMMER GAMES 2	EPYX/US GOLD
26	PARADROID	HEWSON CONSULTANTS
27	ELITE	FIREBIRD
28	SHADOW OF THE UNICORN	MIKROGEN
29	KIK START	MASTERTRONIC
30	SPY VS SPY 2	BEYOND

TOP 10 BUBBLERS

1	WINTER GAMES	
2	SUPER ZAXXON	U.S. GOLD
3	QUEST FOR THE HOLY GRAIL	MASTERTRONIC
4	COMPUTER HITS (10)	BEAU JOLLY
5	SPIKE	FIREBIRD
6	RAID!!	US GOLD
7	ASTRO CLONE	HEWSON CONSULTANTS
8	SOUL OF A ROBOT	MASTERTRONIC
9	STRIKE FORCE HARRIER	MIRRORSOFT
10	ONE MAN AND HIS DROID	MASTERTRONIC

SPECTRUM SALES

THIS	LAST	WKS	TITLE	PUBLISHER
01	NE	01	MONTY ON THE RUN	GREMLIN GRAPHICS
02	01	02	IMPOSSIBLE MISSION	US GOLD
03	02	10	WAY OF THE EXPLODING FIST	MELBOURNE HOUSE
04	03	07	DALEY THOMPSON'S SUPER TEST	OCEAN
05	NE	01	STARQUAKE	BUBBLE BUS
06	04	05	FIGHTING WARRIOR	MELBOURNE HOUSE
07	06	07	FAIRLIGHT	THE EDGE
08	08	03	GRAHAM GOOCH TEST CRICKET	AUDIOGENIC
09	NE	01	WORLD SERIES BASKET BALL	IMAGINE
10	RE	05	ACTION BIKER	MASTERTRONIC

COMMODORE SALES

THIS	LAST	WKS	TITLE	PUBLISHER
01	NE	01	MONTY ON THE RUN	GREMLIN GRAPHICS
02	01	02	WHO DARES WINS 2	ALLIGATA
03	02	10	SUMMER GAMES 2	EPYX/US GOLD
04	06	02	PARADROID	HEWSON CONSULTANTS
05	04	06	FRANK BRUNOS BOXING	ELITE
06	05	11	WAY OF THE EXPLODING FIST	MELBOURNE HOUSE
07	RE	05	KIK START	MASTERTRONIC
08	03	05	SPY VS SPY 2	BEYOND
09	09	08	BARRY MCGUIGAN WORLD CHAMPIONS	ACTIVISION
10	RE	10	BEACH HEAD 2	ACCESS/US GOLD

AMSTRAD SALES

THIS	LAST	WKS	TITLE	PUBLISHER
01	04	10	FINDERS KEEPERS	MASTERTRONIC
02	NE	01	RAID!!	US GOLD
03	10	10	FRANK BRUNOS BOXING	ELITE
04	08	02	SOUL OF A ROBOT	MASTERTRONIC
05	02	11	WAY OF THE EXPLODING FIST	MELBOURNE HOUSE
06	07	11	NONTERRAQUEOUS	MASTERTRONIC
07	01	02	FORMULA ONE SIMULATOR	MASTERTRONIC
08	03	03	GRAND PRIX 3D	SOFTWARE INVASION
09	09	11	CHILLER	MASTERTRONIC
10	06	08	LOCOMOTION	MASTERTRONIC

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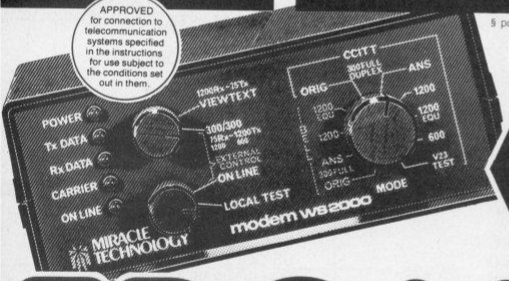

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FAIRLIGHT

▶ *Spectrum • The Edge • Arcade adventure • £9.95 • Toby Wolpe*

VALUE FOR MONEY ●●●●
GRAPHICS ●●●●●
PLAYABILITY ●●●●
SOUND ●
OVERALL RATING ●●●●

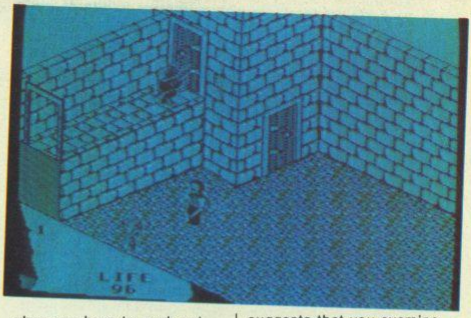
In the mythical kingdom of Covent Garden, once people by a fair race, a band of strolling software magicians, known to story-tellers as Ye Edge, conjured up a corny sub-Tolkein plot to accompany a truly wonderful arcade adventure — Fairlight.

But once you're inside the dubious-sounding Castle Avars you soon forget about background details like the land of Fairlight slipping into chaos and darkness. The graphics are excellent, better in some ways than Ultimate's latest offering Nightshade. The Edge put it down to "The 3-D Worldmaker Technique".

Whatever you want to call it, the result is good, smooth animation in two colours.

As with all the best games the idea behind it is simple. You, Isvar, must escape from the castle by finding The Book of Light. There's also the standard hooded old man of mystery who presumably gets out when you do.

The idea may be simple but escaping isn't. Collecting the right items is the only way of mapping out the castle's 80-odd ogres. Finding the objects isn't too bad — the early ones at least. The problems start when you have to work out what to do with them.



SCREENS
• When the going gets tough in Fairlight a scroll will help you get going again.

The scroll is the sorcerer's equivalent of an ejector seat; when the going gets tough it'll plonk you down in the relative safety of the courtyard. The bag of gold is handy for bribing certain guards, while food, keys and magic potion should all be fairly self-explanatory.

To reach certain objects like the egg timer requires a lot of shoving and stacking of furniture. Addicts of Ultimate's Knight Lore and Alien 8 will really feel at home.

The booklet with the game suggests that you examine the cover, opening screen and text for clues. To me the cover showed a wizard loosely resembling Edge boss Tim Langdell reading a radioactive *Your Computer* binder. The opening screen did however give a few hints; it gives you an aerial view of part of the castle, for example.

Apart from its graphics and complexity, it's touches like Isvar's five pocket and the weight restrictions on what you can carry that make this such a good game. Should keep you happily gnashing your teeth for hours.

3D GRAND PRIX

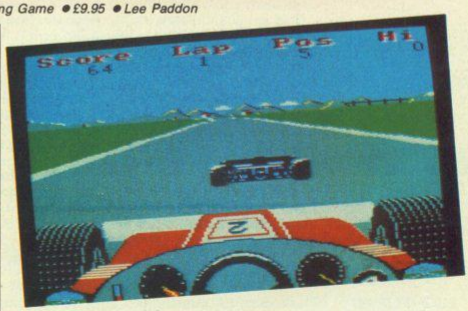
▶ *Any Amstrad • Amsoft • Racing Game • £9.95 • Lee Paddon*

VALUE FOR MONEY ●●●
GRAPHICS ●●●
PLAYABILITY ●●●●
SOUND ●●●
OVERALL RATING ●●●

Well, if Nigel Mansell can win a Grand Prix, I suppose anything's possible. So perhaps a few laps of this might show you if you've got what it takes.

You get a cockpit view of the track ahead, with rev counter, speedo, temperature gauge and wing mirrors. You get eight circuits to tackle in turn. You have to finish in the top three of one race to proceed to the next. The opposition starts easy and gets tougher as you go on.

The car has four gears, accelerator, steering and brakes. The steering is of the usual digital variety, and rate of turning depends on speed. If you corner too sharply, you spin off. The usual Pole Position tactic of overtaking on the grass gets you nowhere fast, and the other cars have a nasty habit of blocking you. The temperature gauge limits the amount of time you can go at full pelt, overheating produces a dramatic loss of speed.



SCREENS
• Clear cockpit display with Revs style wing mirror.

As far as a simulation of a race goes, this one slots in somewhere between Pole Position and Taledega, but that said, it is easily the best racing simulation for the Amstrad.

HACKER

▶CBM-64 • Activision • Hacking • £8.95 • Lee Padon

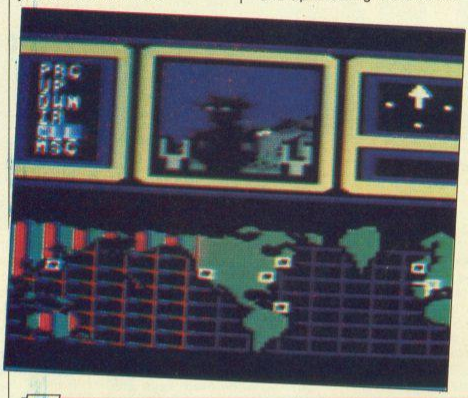
VALUE FOR MONEY ●●●
GRAPHICS ●●●
PLAYABILITY ●●●
SOUND ●●

Possibly about the worst thing you can do if you want to play this game is read a review of it. After loading up, you are left with the enigmatic message "Logon:", and that's it. No instructions, no hints, no nothing. Thus, if you read a review, you will end up knowing more about the game than was intended, and discovery is half the fun.

What it boils down to is trudging around the world in your little gismo — or SRU if you prefer — negotiating with spies, piecing together documents and acquiring information about the network you have penetrated.

Is it a simulation of hacking? Well, yes, in as much as that is possible. It is the same combination of logic, inspired guesswork and lucky breaks. Is it fun? After all, one of the main motivations for hacking is you are doing something illegal, you don't get the same thrill with Hacker. Still, there are enough problems to solve in what might be termed an electronic adventure game to keep most would-be hackers happy and it'll keep the phone bill down.

OVERALL RATING ●●●



SCREENS
• The grid represents a network of secret tunnels linking cities around the world.

CRUSADE IN EUROPE

▶CBM-64 • Wargame • US Gold • £23 • Lee Paddon

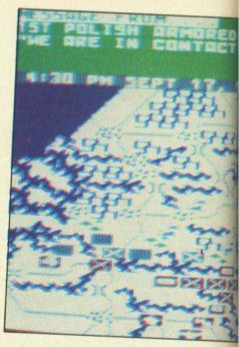
VALUE FOR MONEY ●●●●
GRAPHICS ●●●●
PLAYABILITY ●●●●
SOUND ●●●

"All very clever, but it's not really a simulation," has until now been the stock response of tabletop wargame enthusiasts to the computerised variety. However, this game is going to set a new standard, with an outstanding combination of realism and playability.

The game simulates the campaign in North-West Europe, from the D Day landings to the Battle of the Bulge. This can either be done in a series of scenarios tackling the major battles, or as a continuous campaign covering the four months to the beginning of October. The screen shows the units involved in the battle, the terrain, any enemy units you are in contact with, a text window for messages, and a cursor for entering commands.

To enter a command, you place the cursor over the unit, and press fire. This gives a detailed picture of the unit's current status, its strength, deployment, combat readiness and supply state. You can then proceed to give it orders. There are no separate phases for giving orders, it is all real time, you just give the orders and the units get on with it. Supply considerations take two forms, individual supply, where a check is made every day to determine whether the unit can be supplied, and overall supply, where the amount of supply used is calculated and compared with the amount of supply flowing in. This can restrict the amount of activity possible. All this detail gives a great feel of overall command. You give the orders while remaining unencumbered bys the detail, free to keep a strategic view of the whole situation.

The game can either be played against the computer, or a human opponent. It can be weighted to one side or the other, and, at the end, the computer assesses the



SCREENS
• Like Eastern Front Crusade's display changes colour depending on the season.

DECISION IN THE DESERT

▶CBM-64 • US Gold • Wargame • £19.95 • Lee Paddon.

VALUE FOR MONEY ●●●●
GRAPHICS ●●●●
PLAYABILITY ●●●●
SOUND ●●●

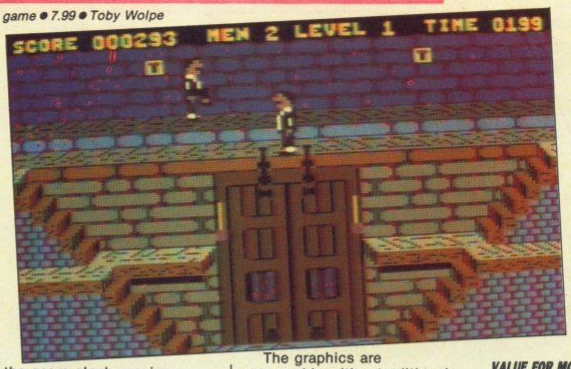
The sequel to Crusade in Europe, this features five scenarios covering the major battles in the Western Desert from Sidi Barrini to El Alamein. The system copes surprisingly well with the complex battles.

Microprose claims it is off to the jungles of Indo China for the next in the series, presumably to cater to the market of Vets eager to refight the war to see what effect nuking Ho Chi Minh City would have had.

OVERALL RATING ●●●●●

SCHIZOFRENIA

▶CBM-64 • Quicksilva • Platform game • 7.99 • Toby Wolpe



This game rates as high in paranoia as it does in frustration. Why is Quicksilva out to persecute me by making it so difficult to play?

Everything you do in screen 1 of this five-screen game is quickly undone by the evil side of Alphonse T Nurd — the other half of your personality. You, the good Alphonse, are a lab cleaner. But instead of just dusting the Atomic Particle Separator, you apparently tried it out on yourself — with personality-splitting results.

The only way of becoming whole again is to make it as far as screen 5 and the Recombination Chamber.

Forgetting the frustration factor for a minute, Schizofrenia has several good original features, like the fact you have to flick two switches on the first screen to stop the timer and start the score clock running.

The score has to be greater than the time you've taken to rack up any points. You score by drawing the four bolts on the great doors that lead to the next chamber. The catch is that your alter-ego is busy flicking the switches back again and sliding the bolts shut.

To get through the lifts and yellow boxes of screen 2 you have to follow Alphonse II around area 1, flicking switches and pulling bolts and then making a rush to the right-hand lever to open the doors.

The graphics are reasonable with a traditional platform game side-on view of the action. But the animation isn't wonderful. The characters prance around the screen like demented Morris men. Even if you're walking along a flat platform, the movement's the same as walking up stairs.

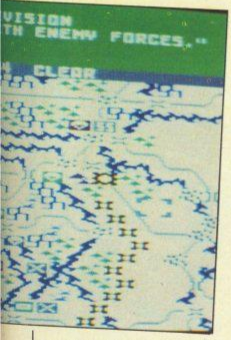
A good, original approach to mental illness which should drive you mad even if you weren't to start with. But I'm in two minds whether to recommend Schizofrenia as a great game.

OVERALL RATING ●●●

VALUE FOR MONEY ●●●
GRAPHICS ●●●
PLAYABILITY ●●●
SOUND ●●

SCREENS

• Don't be fooled by the kitsch look of the product Schizophrenia is really kafhaesque.



overall performance of the players. It may be a steep price, but then you get a lot of game for your money, which should keep the enthusiast happy for a long time, and reflects the amount of care and historical research that has gone into this. Once again, Microprose have produced a great product with lasting appeal.

OVERALL RATING ●●●●●

WHAM — THE JUKE BOX

▶ZX Spectrum • Melbourne House • Music utility • £9.95 • Tony Sacks

There used to be one inviolable certainty to cling to in these changing times — the immutable fact that the Spectrum has just one sound channel. But now even this sacrosanct truth has been rudely, and noisily, shattered by this devilish bit of software which gives the Spectrum two sound channels using the original hardware.

Wham — no connection with the George/Ridley duo, you may be relieved to hear — allows you to compose separate bass and melody lines over a four-octave range and even to include vaguely drum-like effects (but not simultaneously with the notes). Notes are entered and displayed on musical staff and, as they are being played, the notes are depicted by dots bouncing around on a piano keyboard.

The hideously named Whampiler allows you to use the tunes you compose to enliven your own programs. The compiled music takes up less than 1K of memory, no matter how complex it is.

One snag is that all the notes have to be the same length, although rests can be inserted between notes and the tempo of a piece can be varied.

W-TJB will probably appeal most to programmers wanting to add music to their graphic masterpieces; as a stand-alone music-making package its staying power is questionable.

OVERALL RATING ●●●

GRAPHICS ●●
SOUND ●●●●
PLAYABILITY ●●●
VALUE FOR MONEY ●●●●

MIRRORSOFT

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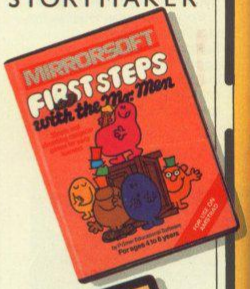
Cassette £9.95



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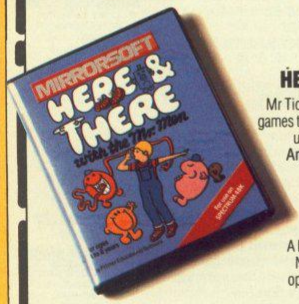
Cassette £8.95



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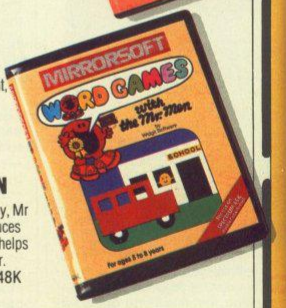
Amstrad • BBC B/Electron • Commodore 64 • MSX • Spectrum 48K
Cassette £7.95



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BATTLE OF BRITAIN

▶ *Amstrad • PSS • Wargame • £9.95 • Lee Paddon*

GRAPHICS ●●●
SOUND ●●
PLAYABILITY ●●●●
VALUE FOR MONEY ●●●●

SCREENS

• Battle of Britain — phew against the many Hunnish hordes.

In this, the latest in PSS's wargame series, you take the part of 11 group controller, directing "The Few" against the Hunnish hordes. The display shows the position of incoming raids, any squadrons you have scrambled, as well as the position of airfields, radar stations and towns in south-east England.

You must attempt to repel the Luftwaffe raids while maintaining the RAF in fairly good nick. In the air, you can be sure of a loss rate of about five to one, but the risk is getting caught on the ground whilst refuelling, which will lose you half the aircraft on the field. This leaves the player with a nice dilema of how many squadrons to commit to dealing with each raid.

As is obligatory with this PSS series, you can have arcade sequences where you fight one of the battles, as usual you are not entirely sure what you are doing and it is best to ignore it. There are three scenarios: introductory game, Blitzkreig, and campaign game. The campaign game broadly follows the pattern of the German campaign, with initial raids on the radar system, followed up by attacks on the airfields.

At the end of each day you get a number of replacements to make your squadrons up to strength.

Definitely the best offering yet in this series, with lots of historical flavour and attention to detail.

OVERALL RATING ●●●

SATELLITE WARRIOR

▶ *Amstrad • Amsoft • Trading Game • £7.95 • Lee Paddon*

GRAPHICS ●●●
SOUND ●●
PLAYABILITY ●●●●
VALUE ●●●

Coming close on the heals of adventure games and Star Trek, Hamurabi and its variants has a long and distinguished history; this game represents a new variation on the familiar theme.

You play either against the computer or another player, the idea is to colonise the solar system with satellites and exploit its economic resources, and thus build more satellites and so on. You are also visited by aliens who can trade you items which you don't produce, there is no direct trading between the players. Regretably, when two players attempt to exploit the same planet, the satellites must duel to the death.

There are three varieties of weapon for use at different ranges, and three types of defence.

The game's overall tone is light hearted, with jolly bug eyed monsters and defeated satellites falling to bits like an MoT failure in the fast lane. Victory is all about getting the bits you need to make really nasty satellites.

OVERALL RATING ●●●

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commodore

CODENAME MAT II

▶ *Spectrum and CBM-64 ● Domark ● Shoot-em-up ● £8.95 ● Lee Paddon*

VALUE FOR MONEY ●●●
GRAPHICS ●●
PLAYABILITY ●●
SOUND ●●●

After the cult status bestowed on the original, this sequel has been eagerly awaited. This time, your old adversaries, the Myons, are bent on destroying a bunch of satellites. You have to protect them by destroying wave after wave of Myons before they have time to wreak havoc.

Between waves, you get a chance to repair either the ship or some satellites. Your ship also has two droids which can make running repairs in combat. The instrumentation is complex with scanners, battle computers, status indicators and so on. Combat consists of warping towards the enemy sector, and then once there, you close in on them using your scanners, and then do a spot of dogfighting.

Damage occurs when you take hits, or collide with the enemy. There are numerous systems all over the ship; damage affects the operation of the ship to a varying extent, and you must decide what gets priority for repair.

Despite all this fairly complex stuff, the guts of the game is shooting Myons and a pretty uninspiring bunch they are too. They come in a variety of shapes and sizes, some with cloaking devices. But really, these days we expect our aliens to be three-dimensional and have a bit more grey matter. This game is in many ways a step backward from the original. Brewster fans were expecting a lot more.

OVERALL RATING ●●●

SCREENS

● Codename MAT II. Myons aren't what they used to be.

STRIKE FORCE HARRIER

▶ *BBC B and Electron ● Mirrorsoft ● Flight Simulator ● £9.95 ● Lee Paddon*

GRAPHICS ●●●
SOUND ●●
PLAYABILITY ●●●
VALUE FOR MONEY ●●●

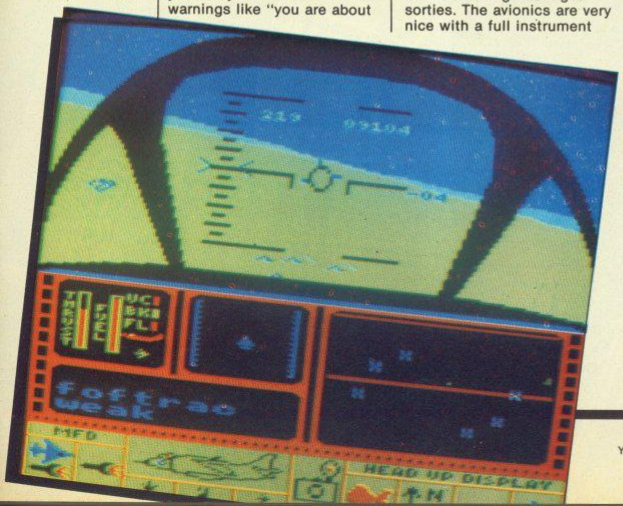
Still playing Aviator? Well at last Mirrorsoft have come to the rescue of Beeb owners still dementedly flying under bridges and shooting space invaders with their Spitfire.

This will take a bit of getting used to for the seat-of-the-pants crowd. The 'plane actually tries to help you to fly it with useful little warnings like "you are about to hit the ground" and "someone is shooting at you". Unfortunately, most of these warnings are accompanied by some of the most ear splitting sound effects witnessed in this office for some time. Definitely one to get the neighbours hammering on the wall during late night sorties. The avionics are very nice with a full instrument panel, Head-Up Display, target computer and air attack radar.

Unfortunately, there is a price to be paid with rather dismal graphics in the way of ground detail and enemy aircraft. The scenario is rather bizarre. You have to destroy an enemy base. In order to do so, you must move through enemy territory knocking out tanks, SAM batteries and aircraft. Having prepared the ground, you land and call up your ground staff to repair and refuel your aircraft.

This you repeat as often as necessary to reach the base. The most exciting feature is the "Viff", or vectored thrust, which is faithfully reproduced. This is not only handy for vertical takeoff and landing, it is also comes in useful in aircombat. Another nice feature is doing high-G turns on the higher levels will cause black-outs (instruments not recommended). All in all, one the flying addicts will want to add to their collection.

OVERALL RATING ●●●●



SCREENS

● Head-up display, target computer and air attack radar in Strike Force Harrier.

ocean

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TOMAHAWK

▶Spectrum • Digital Integration • Arcade Adventure £9.95 • Paul Bond

GRAPHICS ●●●●●
SOUND ●●
PLAYABILITY ●●●●
VALUE FOR MONEY ●●●●
OVERALL RATING ●●●●

SCREENS

• Tomahawk — Flight International likes it.

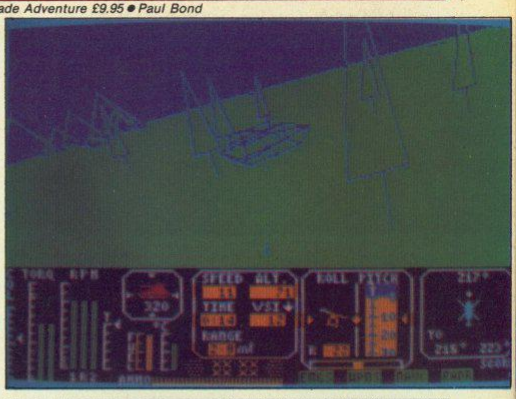
Over 7,000 ground features and some of the best wire-frame 3D graphics this side of Novagen's long-awaited Mercenary, Tomahawk puts you in control of the US Army's latest attack helcopter, the Apache. Promoted by Hughes as "an extension of the pilot's will', it's appropriate that the Spectrum simulation of such a hi-tech heli marks the commercial debut of the Lenslok protection system. This, of course, is a game in itself — hours of fun to be had squinting through a plastic lens at the VDU guessing at the combinations of any two letters of the alphabet.

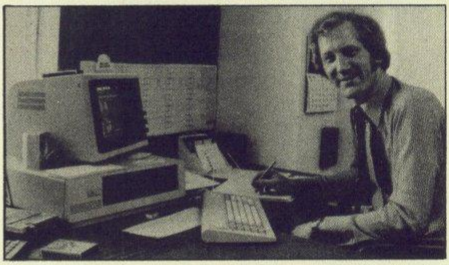
Once past this hurdle, you can open the throttle, ease forward on the collective, and leave the pad. As the 3D world display unreels you will see landing pads, buildings, trees, transmission pylons, mountains, enemy tanks (moving and firing), field guns, and airborne enemy helicopters.

A number of mission scenarios are available to you: flying training or combat, with different difficulty levels, you can select a low cloudbase of a night mission. In this last you can try out the infra-red vision - same game but in red and black. The display will be familiar to afficionadoes of DI's Fighter Pilot, but is much more than an enhanced version. All helicopter characteristics are faithfully reproduced; slowing down is best achieved by use of the cyclic pitch controls rather than reducing throttle level — you tend to plummet — and you can fly sideways or backwards. Weapons include eight Hellfire missiles which automatically destroy anything in your sights plus 38 unguided rockets and a machine gun. The Target Acquisition and Designation System tells you whether your target is friend or foe — most modern military hardware has a built-in identification signal.

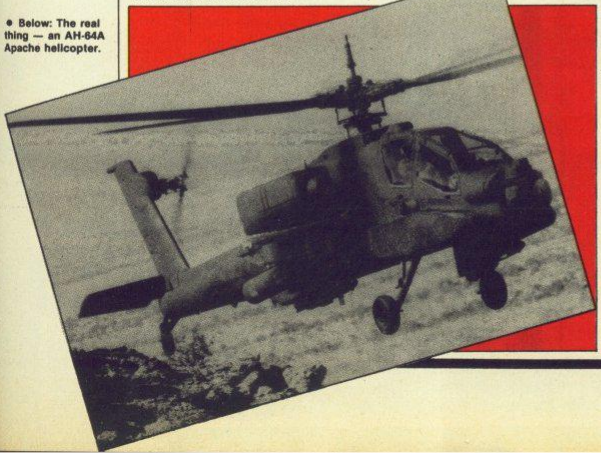
The system has been designed with Interface 2 in mind, so that it's possible to fly like a real helicopter pilot using one joystick for throttle control, the other for altitude control.

Much more accessible to the casual player than Fighter Pilot, what more can I say than that our fellow-journalists on Flight magazine have, over a cup of coffee, voted this one of their favourite games.





• Rigth: Dave Marshall, author of Tomahawk.



• Below: The real thing — an AH-64A Apache helicopter.

THEIR ONLY HOPE WAS YOUR PROMISE TO BRING THEM BACK ALIVE....

BEACH-HEAD II

The continuing saga pits allied forces against the cruel dictator who escaped the destruction of the fortress with remnants of his army and prisoners captured during the land battle.

Produced for the COMMODORE 64 and coming to a computer store near you!

Written by Roger & Bruce Carver • Directed by Bruce Carver • Produced by Chris J. Jones • Distributed by David L. Ashby
Illustration by Oliver Frey (Newsfield Publications) • Manufactured in the U.K. by U.S. Gold.

SOFTWARE SHORTLIST

COLOSSUS CHESS 4.0

▶CBM-64 • CDS Software house • Chess • £9.95, disc £14.95 • Toby Wolpe

VALUE FOR MONEY ●●●●
GRAPHICS ●●
PLAYABILITY ●●●●
SOUND ●
OVERALL RATING ●●●●

With the scalps of major chess programs like Sargon, Superchess, Cyrus and White-Knight to its name, Colossus 4.0 has the power and quality of play to keep most amateurs busy for hours.

Add to that a comprehensive list of features ranging from elapsed-time clocks to blindfold chess and you're certainly getting your money's worth.

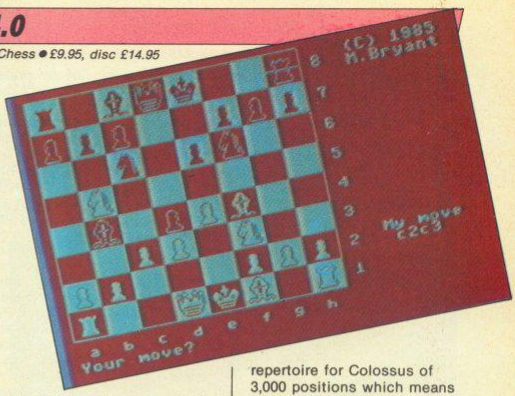
The chess diagram-like view of the board leaves no margin for confusion although in terms of graphics sophistication it's a long way behind Psion's spectacular 3D QL Chess. You pick you move by placing the cursor line over a piece and then on to its destination.

There's also a joystick option, or if you're happier working in algebraic E2-E4s then you can just bash them in directly from the keyboard. As in all the best chess programs you can also back-step through up to 120 moves using B, or forwards with F. A quick poke at the R key gives a full action replay.

You have six playing modes to choose from. They range from Tournament with its four time contols, through Average mode where you can pick the computer's response time, to the Equality, All-the-moves, Infinite and Problem modes. Colossus always starts off in Average mode unless you specify something else.

CDS claims an opening repertoire for Colossus of 3,000 positions which means if there is to be any agonising about the opening moves it's you who does it.

Colossus presents you with two screens. One is text only, and gives you details of the moves played so far together with the program's thoughts on possible lines of play and times. The second screen holds the graphical picture of the board. You can flick to and fro from one screen to another with a tap of the space-bar.



SCREENS

• Colossus Chess 4.0 — for the budding Kasparov.

MARSPORT

▶Spectrum • Gargoyle • Arcade adventure • Meirion Jones

VALUE FOR MONEY ●●●●●
GRAPHICS ●●●●
PLAYABILITY ●●●●
SOUND ●●
OVERALL RATING ●●●●

If you ever wanted to know what a ninepin feels like in a skittles alley then Marsport is the game for you. There you are doing the usual Dun Darach Tir Na Nog bit clomping around like Piltdown Man but this time in a space bubble on Mars rather than in some medieval marsh.

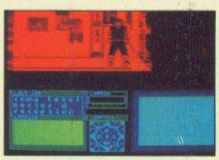
Every so often a bowl hurtles by at head height — but just for once in a computer game you don't have to duck, for these are harmless information gathering robots.

Previous Gargoyle games were a bit thin on plot, but Marsport is an intricate and well structured arcade adventure with much more going on. In the first stage of the game you — or rather Commander John Marsh of the underground Earth liberation movement Hasp — have to acquire a power weapon and fight your way through the 10 levels of the city trying to locate the central computer.

A series of hatches in the walls open as you walk by. These can be supply units for which you sometimes need a key which give you objects to use, lockers which you can stow your objects in — because you can only carry three at a time, bins, and charge units to keep your gun loaded.

You need the gun to deal with robots and Septs — the invading life-forms which Gargoyle politely calls a hive culture but which we all know is really just a swarm of intergalactic killer bees. But then I suppose the Septs would call Commander Marsh a terrorist (Geddit?).

The most fearsome adversary in the game is a Sept Warlord — which looks just like a Victorian vacuum cleaner and is almost as dangerous.



The robots that occasionally attack you are malfunctioning warden robots installed by your own forces long ago. If only they belonged to the other side we could call them septic tanks. Once you have reached the computer you can start your search for the original plans for the giant force field which is all that stands between the Septs and Earth and now needs stengthening. Your final challenge is to escape with the plans.

SCREENS

• Marsport — you'll feel like a ninepin in a skittles alley.

CRITICAL MASS

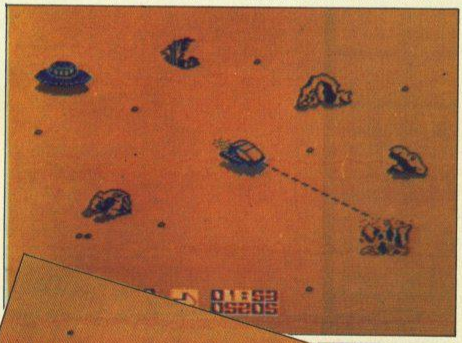
Spectrum ● Durell Software ● Arcade Safari ● £9.95 ● Paul Bond

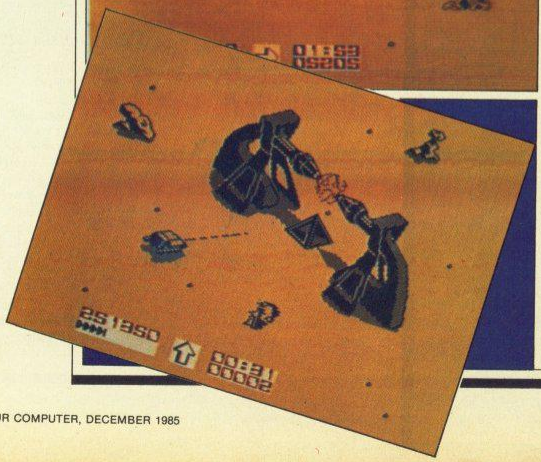
VALUE FOR MONEY ●●●●
GRAPHICS ●●●●●
PLAYABILITY ●●●
SOUND ●●●
OVERALL RATING ●●●●

Trashed my strike craft in a rock outcrop — anybody knows what that means out here. As the wreckage bounced away from me I punched the button on my jet pack and got sky-side just as the sand-worm reared its ugly head a few feet from me. Back to the pressure-dome for a new ship — losing your no-claims bonus is bad enough but when aliens have infiltrated into your power-plant in a bid to make it meltdown the local star-system you don't worry so much about that kind of thing.

Brilliant graphics and an original enough game concept programmed by Simon Francis. Durell have a real winner here. The screen shows an aerial 3D view of a barren desert landscape, cheerful tunes play in the background (if you can hear them on your Spectrum). Fly your surface skimmer towards the right hand side of the screen. Try not to hit any rock outcrops or UFOs otherwise you spin off like a drunken dodgem driver. Too many smashes and your ship blows up — this effect is particularly good with all the bits bouncing all over the place. An arrow at the base of the screen indicated where the nearest pressure dome is. Get into the vicinity and you are sucked in.

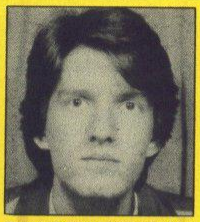
The dome then bifurcates and releases you in your new skimmer. Paul Atreides would be at home on this planet since giant Dune-style sandworms rear their ugly heads and reduce your energy if you bump into them. Dull it isn't. You can shoot back at attacking vehicles although many of the phenomena which assault you are indestructible and very very persistent. A swarm of diamond-shaped objects is generally the finishing element for people trying to penetrate the outer wall of the power plant, where all the real fun with the enemy counter-attack vehicles begins. Excellent and also available for Commodore.





SCREENS

● Critical Mass — Brilliant graphics and an original game concept.



Simon Francis learned about commercial software the hard way. He wrote a couple of games for the Dragon 32, and his "friends" persuaded him to take his name out of the program. Due to the Dragon's later demise, he thought no more about it until he saw his program being marketed by a large budget software company at a *Your Computer* show. "I haven't been ripped off that much. If it had been for a really popular machine like the Spectrum or the 64 I would have lost thousands of pounds. Still, they're not my friends anymore."

There are a thousand stories like this in the software city, but this may have been a contributory factor in forcing Simon to wean himself off the 6809 processor. "I loathe the Z-80." This should give heart to hard-done-by Dragon owners everywhere. Fighting his revulsion with its CPU, Simon started the Spectrum game as a small window at the top left-hand-side of the screen, using interrupt mode 2 to print up all the characters, first in memory, then to the screen.

"When I expanded the screen up my memory dump was 6K — obviously any larger would be too much memory so I had to modify all my routines accordingly." The main core of the game is written using the latest techniques — "You can usually work out what's going on in the programming just by looking at the screen. I sometimes videorecord games, play them back at different speeds — tells you lots of things." Simon gives full credit to Durell colleagues Robert White and Dave Cummings. Julian Breeze did the music — "It would have taken me 10 years to do it."

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* Note due to memory limitations ACE on the C16 and VIC20 (+8K Ram) do not have any ground objects.

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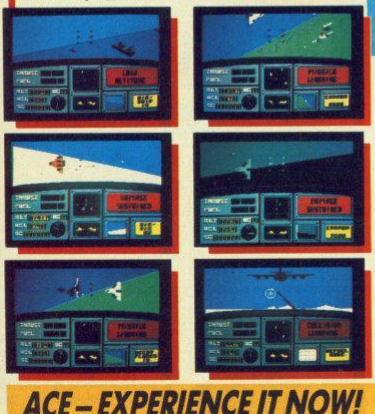

Screen shots are for CBM 64 version. Other versions may vary.

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The Ocean

Transformers, Streethawk, Knightrider, Rambo and V — names that might make up an evening's TV /Video viewing. But as any Transformers fan will know, nothing is what it seems — thanks to Ocean all these action-packed names are turning into computer games. Along with the licenced Konami arcade games scheduled for release on Ocean's Imagine label, this adds up to a veritable tsunami of software from the three-year old company.

Does a licensed computer game necessarily make a killing? Group Chairman David Ward emphasises that it's the creative process of making software that's important. "Licensing just helps us to position the product. It's all to do with being part of contemporary society."

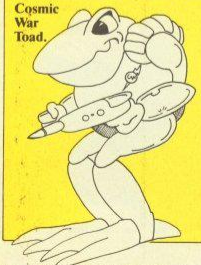
The Imagine label, now owned by Ocean, is at the moment releasing home computer versions of Konami arcade games — a different form of licensing from using TV or film-related ideas. "There are only about 20 original games in the whole life of the industry — rather than just plagiarise, we prefer licensing other people's ideas." Ocean plans to move beyond the arcade. The new Ocean IQ label plans to release Laser Basic and Laser Compiler for Spectrum, CBM-64 and Amstrad, along with music software, a screen designer and a Pascal.

Heavy stuff, agrees David Ward: "The IQ label is to do applications packages for the same machines that Ocean markets for. We've got to grow up with our custombers at the same time as getting new ones. A different label is necessary because people are used to arcade games from Ocean. You don't expect to open a tin of Heinz beans and find condensed milk in it."

Licensing is a tricky business. Transformers — the robot toys which turn into trucks or aircraft — were an obvious chase due to the massive success of both toys and TV series around last Christmas. But at the time Ocean acquired the rights to Sylvester Stallone's Rambo movie, they didn't face much competition.

"It was before Reagan's remark about knowing what to do next time he faced a hostage situation. That made it something else", says Ocean managing director Jon Woods. "Also, in my view, there's something of a depressed market in the States. New machine formats are coming along, so not much is being developed for the Commodore 64. Rambo was a surprise success, with not much prior licensing, unlike say Goonies which attracted a lot of attention becuse it had Spielberg's name on it."

Cosmic War Toad.



A silicon Rambo

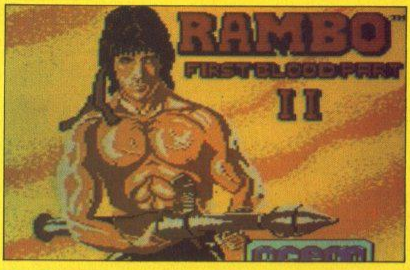
The silicon Rambo is a real epic with the combined talents of Daley Thompson's Decathlon and Hunchback II programmers Tony Pomfret and Dave "I'm starting to forget all the games I've written" Collier, plus Martin Galway on music and Steve "I used to be just an ordinary person" Wahid on graphics.

Although Martin Galway has added in self-composed passages of music the original pounding bass and swooping synthesiser sounds remain and music even plays while loading. "It's not loading the whole time — there are 50 times a second when it can play music." The morse code in the loading tune is actually tapping out a real secret message, so have your note pads at the ready and you may learn something to your advantage.

Although Martin has a number of instruments at Ocean HQ in Manchester, an upright piano and a Seiko DS-320 synthesiser, his preferred machine is the Yamaha CX-5. He has also worked on the sound effects, everthing from approaching helicopters to the various mortars and machine guns the deadly dogface has festooned around his person. Remarks that the game itself resembles Alligata's Whos Dares Wins — subject to legal action from Elite (they claim it infringes their license to the arcade game Commando) — are quickly rebuffed.

"In those games you can only move upwards, and you only have a gun and hand grenade. In this you have all the weapons that Rambo has in the film." Certain sections of the game have to be completed silently. Once the first prizoner is rescued from his crucifix in the stockade you can forget about the knife and the arrows and really let rip. But you've got to collect the additional weapons from around the screen, acquiring them in the same way as the morose militarist arms himself in the movie.

You can blast your way through the jungle, but a river blocks your escape. Naturally you steal a helicopter and fly back to the compound to rescue the other inmates a la Choplifter.



Top: Rambo. Centre: Comic Bakery. Above: Yie Ar Kung-Fu.

wave

Paul Bond is all at sea with Ocean.

Chances are that a giant helicopter will give chase as you fly back up the screen, so it's non-stop action all the way.

When two tribes go to war there are plenty of points to be scored as Denton Designs who programmed Frankie Goes To Hollywood for Ocean well know. This Christmas it will be the two tribes of Transformers — Autobots v Decepticons — who will be fighting it out on computer screens worldwide, thanks to Denton's Tony Sanders and Ally Noble (graphics).

Collect energy pods

The goal of the game which features music from the TV show is to collect all the components parts of the Transformers' mask emblem. If the Decepticons collect the 15 pieces before you do, you lose. As one of the five Autobots, Optimus Prime (turns into a truck), Hand (turns into a jeep), Mirage (turns into a racing car), Bumblebee (turns into a VW Beetle) and Jazz (turns into a Porsche) you move around the ramps and levels on the screen, hounded by the flying Decepticons. As a vehicle you move faster across the ground, but as a robot you can fly and fire.

As you move about you must also collect energy pods, and you can use defensa-pods to switch control from one robot to another without destroying it. The five robots in existence appear icon-style at the base of the screen. "At first we were going to have a different screen for each Transormer. Then we changed it to one large scrolling map" says Tony Sanders.

It's not all licensed games that Denton are doing for Ocean as Ally Noble is quick to point out — a new game under the working title Cosmic War Toads is "sort of a Denton in-joke", she says. "We used to make up these silly ideas for a game with toads in, then we thought it might be a good idea to actually make it into a program." So you might expect the action to take place in blackest outer space, and you might be ready for one of the mini-environments to be a lily-pond — but a plate of frogs' legs in a French restaurant? Or beef sausages cooked in batter (toad-in-the-hole, geddit?)

You score Toad points by finding and killing Regellian slime-beasts — the slime master and his slime pawns. You can also delay their progress and the use of pond stones. Along with War Duck — the webbed warrior — and Porkula the cosmic vamp you are embroiled in the struggle to make the world a safer place to spawn.

Konami is a name popular amongst people who like pushing coins in slots — now courtesy of Ocean's Imagine label, you can save the wear on your wallet. Yie ar Kung Fu on Spectrum, CBM-64 and Amstrad is a colourful addition to the growing mass of martial arts simulations; along with Comic Bakery, basically a good solid platform game, and Mikie, initially on the Spectrum all these arcade hits will be available at Christmas.

Mikie is set in an American high-school — "Failure teaches success" — declaims a motto on one of the blackboards. He has to put together parts of a message whilst winning the hearts of the young co-eds; at the same time he is harassed by teachers, janitors and the muscle-bound football team. Colin Gresty and the inscrutable Joff are two of the Ocean programmers involved in the Konami work. Joff uses a Tatung Einstein to develop the Z-80-based versions of the programs. "The assembler is really brilliant, a pleasure to use."

Ocean have managed to tie up licenses for both the modern-day knights in shining armour currently tearing across TV screens around the globe — Streethawk and Knightrider. The initial game plan includes facility for synthesised speech and possibility of up to four different scenarios. The baddy in this program is SKARR, a vehicle duplicating Michael Knight's robot supercar KITT.

Built by a hostile foreign power, the vehicle is a real argument for state-subsidied free public transport, since it wants to do things like murder the El Salvadorian president whilst giving a talk in Los Angeles, nuke the New York World Trade Centre, kill the US President, and sabotage a shuttle carrying an SDI Star Wars satellite. Apart

from discouraging such boisterousness, Mr Knight and KITT have to find the smuggled Russian (oops, there I said it!) gold which is financing the operation. There will be a number of variables in the game, so it will be different each time it is played.

In Streethawk the hero and his computerised motorbike have the job of defending a female VIP from a gang of kidnappers.

The V sign to aliens

Computer games, like theatrical productions, can mutate considerably before their first night, so some ideas may be dropped and others added. At the moment the game plan for Ocean's program based on the space reptile soap opera "V" gives you the chance to totally annihilate the aliens' mothership and save humanity from becoming an interesting little item on the galactic menu.

The top two-thirds of the screen will show a scrolling network of air-vents and corridors deep within the heart of the Visitors' Mother Ship. Some of these corridors will lead into large open spaces, whilst others will lead into laboratories and storage rooms. Air-locks will lead onto the outer surface of the Mother Ship. Occasionally the player will find doorways leading to "Horizontal Lifts", or transporters.

The bottom third of the screen is used for hand-held communicator/computer and associated status information. Alternatively, the screen will show a number of icon-driven options which the player can take.

The Mother Ship itself is layed out in six vertical planes as indicated by figure 1. Each plane is built from 128 different screens. Each screen wil utilise eight building blocks of 8 × 6 characters.

The actual "map" of each plane will be randomly generated

Left: Steve Blower, art director of Ocean. Above: David Ward.

at the beginning of each game so there will be plenty of variety.

You, of course, are Donovan the rebel leader and only man on earth who can act with his hairline. You guide him around the mother ship armed with a gun which can kill the visitors but not the robots. The communicator/computer section of the screen has a map of the level you are currently on and can be used to confuse the aliens' central computer.

If they pump gas into your sector you'll have to grab some oxygen cylinders. And if he leaves the ship, Donovan better be wearing a helmet. Certain tasks must be performed outside the ship — mainly destroying the main water inlet or destroying the main communications centre. Other tasks to complete may include destruction of various electrical generators, disabling the air purification plant and sabotaging the central computer.

Veterans of the Starship Paradroids will be pleased to know that the Visitor's robots are divided up into sensor robots (which can see Donovan in the dark), cleaner robots which float at head height firing lasers, security robots which bob up and down and zap, together with maintenance robots. But they are useful to Donovan, insofar as he can trick them into opening doors that he can't.

The game promises to be well within the Ocean tradition of not only integrating real elements of the licensed original, but also creating a grippling and innovative computer game. Will this policy lead to their gobbling up their rivals like Diana polishing off a hamster? We shall see.

The Commodore 128.
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QUEST CORNER

Our man with the brass lamp and the key to a thousand mysteries sheds light on new adventure programs. Lost? Never fear, Hugo North is here.

TERRORMOLINOS

▶ *CBM 64/Spectrum/BBC/Electron/Amstrad • Melbourne House*

From the authors of Hampstead comes yet another original and hugely entertaining adventure. Let me warn you now that if you're intending to go to Spain for your holiday next year, this game is likely to make you want to change your plans.

Your objective is not to slay wicked sorcerers, duff up dragons or track down the 200 lost treasures of Trantos. No, no, those are a piece of paella compared with this game. What you are faced with here is one of the most perilous assignments known to English mankind — survive a two-week package holiday with the wife and kids in sunny Terrormolinos. And you must bring back 10 snapshots to prove it.

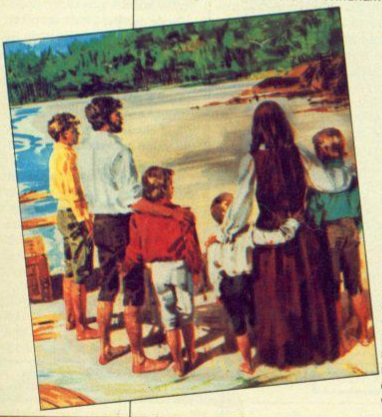
Before you can even set off for the Hotel Excrucio in Terrormolinos, you must first pack, naturally. Just as in real life, things you want are never where they should be and something always goes wrong at the last minute. The taxi's waiting outside but where the heck has little Doreen got to? Where did you put that camera? And what's that white gunge seeping out of the suitcase you've just packed.

One feature that makes this text adventure even more of a giggle is that every time disaster strikes, a colour snapshot of your misfortune is displayed on screen in glorious Saucivision.

A real hoot of a game, and novel with it. If you like a good guffaw, Terrormolinos will tickle your fancy.

SWISS FAMILY ROBINSON

▶ *Commodore 64 • Windham Classics*



This one impressed me right from its opening animated sequence of windtossed ship and accompanying thunder and lightning.

The top two-thirds of the screen are used mainly for simple but effective graphical representations of each location and any objects lying around. The lower portion is used for text input and output.

The game is very user-friendly and has many innovative features. For example, it will complete in full any abbreviated commands you enter, will highlight the command only if it is relevant to the current situation and will offer help, including a list of appropriate commands and their use, when you ask for it.

You begin on board the wrecked ship. Your first task is to search for and collect suitable supplies and then to find a safe way off the ship and to the nearby tropical island for you and the rest of the family.

Your ultimate aim is to survive and be rescued from the tropical isle. Even though you should be familiar with the plot of this classic tale, you'll still need all your creative wits to survive and reach a successful conclusion.

This is a big (over 220 locations) adventure, thoughtfully designed, with lots to do and plenty of stimulating challenges to grapple with. Highly recommended.

THE CRYSTAL BALL

H.A.L.A. (Hints Archive for Lost Adventurers) is a new postal reference service for adventure devotees. And it's free. All they ask in return is a S.A.E. and any maps, clues, etc. for any adventure that you have already completed so that they can keep on expanding their adventure archives.

The service sounds fast and comprehensive. If you're interested, why not write to Sonia Griffiths-Glover (Keeper of the Archive) at 38 Bellfield Drive, Well Lane, Willerby, East Yorkshire HU10 6HQ.

A HELPING HAND

Simon Wicklowson of Nottingham and Paul Bradford of Southampton are having trouble with Spiderman. Ringmaster a problem?

BONK NRUT NEHT BONK HEUP MOOR RETN ESEY ERUO YESO LC

Can't start the presses?

ELAC SEHT NOEL POEP ONID ULCN IELB ISSO PONI HTYR EVET UP

Mrs. Pritchard of BFPO 43 is baffled in Lords Of Time. Cavemen a problem?

(a) TIPM ORFR ORRI MTEG

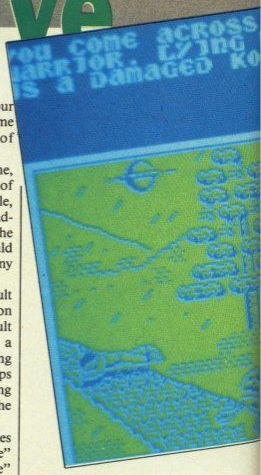
(b) SURU ASOT NORB TARO PRIM EVAW NEHT SEVRE LEVR W

(c) NEME VACR AENR ORRI MPOR D

Carlo Rossi of Milan is stymied in Zork I. Can't open the jewelled egg?

TILA ETSF EIHT EHTT EL

Make it live



Last month we saw how "tree structures" can sort different conditions. If you missed that instalment, don't worry, because you'll find it quite easy to pick up the thread this month when we show you how to adapt these programming techniques for you own use.

Just to recap, we designed a tree like that shown in figure 1 to sort a number of conditions relating to a prisoner in a dungeon. If you examine the tree, you should be able to follow the logic of it, which in pseudo-Basic might be expressed as a series of If statements, like this:

```
IF (the player in the dungeon)
AND (there are rats present)
AND (the rats are hungry)
THEN PRINT "AAAAAGH!"
IF (the player is in the
dungeon) AND (there are rats
present
AND (the rats aren't hungry)
THEN PRINT "LUCKY YOU!"
IF (the player is in the
dungeon) AND (there are no
rats present)...
```

and so on. As you can see, we need quite a few If statements to sort all the connections, and a tree structure enables us to do theis more economically.

We also discussed the different types of nodes which go to make up the tree, and dealt with two basic types: terminal nodes — which have no branches leading from them; and choice nodes — which test a condition and then branch accordingly.

If you look at figure 1, you can see the various nodes labelled with either a C or a T depending on their type. If we store in an array the information about each node — its typed, and, 'if it's a choice node, the condition it tests plus to nodes it jumps to we can then write a simple routne which will start at node 1 and run down through the tree. We'll see this in action in a moment.

A simple affair

The tree in figure 1, however, is a very simple affair. We want to be able to design a tree that will enable us to handle interactive character in an adventure game, or any other task we care to tackle, and for these sort of applications something rather more complex is required.

If you look at figure 2, you'll see another tree again designed, to test conditions relating to our imaginary prisoner, but this time there are a number of differences.

First, you will notice not one, but three different types of terminal node. For example, node number 16 is just a dead-end. If the program sorting the tree were to arrive here, it would simply exit without taking any action.

Node 3, however, would result in the printing of a message on exit, and node 15 would result not only in the printing of a message, but also the carrying out of certain actions, perhaps clearing the screen, or adjusting some variables relating to the prisoner's status.

We can call these three types of terminal node a "simple" terminal node, a "message" terminal node, and an "action" terminal node. Not only are there different types of terminal node, but there are also different types of choice node.

Node number 2, needs to test a condition that in this example hasn't yet bee set up, so it first needs to jump to a routine that asks the player for the necessary information. In other words, before proceeding it has to jump out of the tree, ask a question, and then proceed accordingly. This is called a 'proceudre' node.

Node number 14, on the other hand, is a simple choice node — the condition it tests has already been set up during the program and stroed in a variable — in this case by the procedure noe number 1 — so it simply checks it and carries on accordingly to the value, true or false, that it finds there.

Sometimes, however, we might want to jump to one of more than just two different nodes. Supposing that in our adventure game there are three guards wandering around the dungeon,

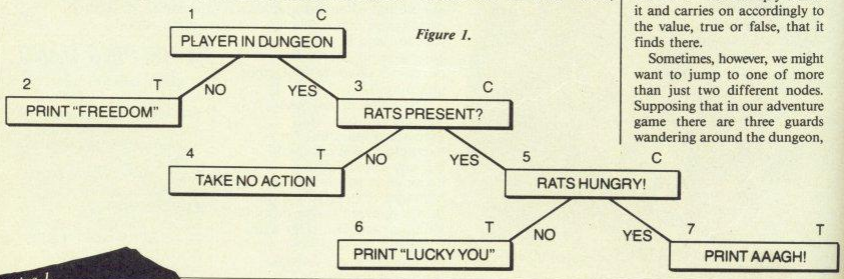


Figure 1.

Listing 1.

```
10 REM ********************************
20 REM initialise arrays
30 REM ********************************
40 REM
50  DIM  t(17,4):  REM tree  array  - 16
nodes each with four data items
60  DIM c(2):  REM two conditions to  be
stored for testing
70   DIM  m$(13):   REM  there  are   13
different messages
80  REM read data into tree array - four
data items for each of 17 nodes
90  FOR n=1 TO 17:  FOR d=1 TO  4:  READ
t(n,d): NEXT d: NEXT n
100 REM read messages into m$(13)
110 FOR n=1 TO 13: READ m$(n): NEXT n
120 REM
130 REM ********************************
140 REM sort through tree
150 REM ********************************
160 REM
170 n=1: REM start at node 1
180  ON t(n,1) GOTO 220,320,370,450,510,
600,670
190 REM ------------------------------
200 REM choice nds (t(n,1)=1) jump here
210 REM ------------------------------
220  n=t(n,c(t(n,2))+3):   GOTO 180:  REM
value held in t(n,2)...
230 REM ...is used to select a condition
from the c array...
240  REM ...the value of which (true  or
false) is added to 3 to get...
250  REM  ...the new  node  number  from
either t(n,3) or t(n,4)
260  REM  ...the program then jumps  back
to line 180 to carry on down...
270 REM ...the tree
280 REM ------------------------------
290 REM .....simple terminal nodes.....
300 REM .....(t(n,1)=2)  jump here.....
310 REM ------------------------------
320 END
330 REM ------------------------------
340 REM .....action terminal nodes.....
350 REM .....(t(n,1)=3)  jump here.....
360 REM ------------------------------
370  GOSUB  760:   REM  jump  to  action
routine via jumpblock
380 IF t(n,4)=0 THEN END: REM no message
so end
390 GOSUB 1020:  REM select message  and
print
400 END
410 REM ------------------------------
420 REM ....message terminal  nodes....
430 REM .....(t(n,1)=4)  jump here.....
440 REM ------------------------------
```

Left: Souls of Darkon — This is a typical latter-day adventure running on the Amstrad that makes limited use of other characters. The player is accompanied by Komputa, a loyal robotic friend. Unfortunately, like so many games, the character doesn't really play much of a role, and interaction with it is virtually non-existent. Above: Subsunk is one of a vast number of games that have been produced using the Quill. Unfortunately there is no provision on the Quill for introducing true interactive characters though they can be simulated. Below: Ashkeron! — This game uses an interrupt routine, similar to that used in the Hobbit, which enables events to take place in real-time. To some extent this has been used to implement 'independant' characters who move about the locations and may either capture or try to kill you. Interaction with them, at least as far as speech is concerned, is however very limited.

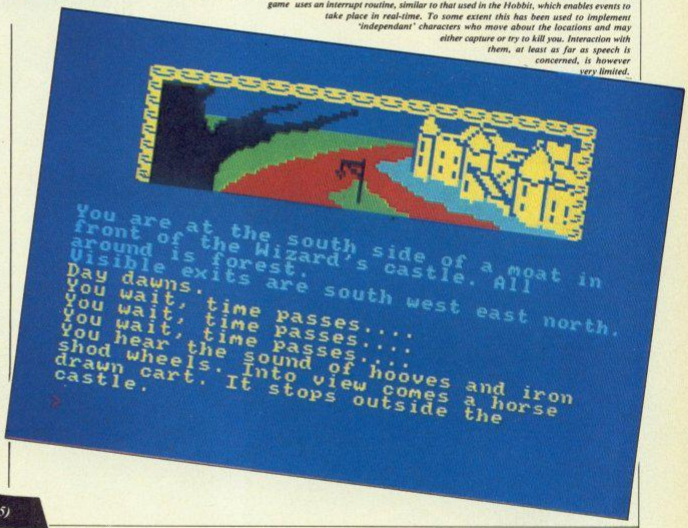
but they are not always all there at the same time — we might want to jump to one of three different routines according to how many guards are present. Node 9 does just this, and we can call this type of choice node a "multiple choice" node.

Numbered sequentially

Note that the three nodes it jumps to are numbered sequentially — this is because at runtime the program will test for the number of guards and calculate the node to jump to by adding that number to the lowest-node-number-to-branch-to minus one. So one guard will cause a jump to node 13 (12+1), two guards to node 14, and so on. In this particular instance there can only be a maximum of three guards.

Finally there's a random choice node number 7 which is similar to a multiple-choice node, but rather than test a condition it simply generates a

(continued on page 55)




```
450  GOSUB 1020:  REM select message and
print
460 END
470 REM ------------------------------
480 REM ....random branching  nodes....
490 REM .....(t(n,1)=5)  jump here.....
500 REM ------------------------------
510  r=t(n,2):  GOSUB 1030:  REM get a
random number in range indicated...
520 REM ...by t(n,2)
530  m=t(n,3)+r-1:  REM get new node
number  by adding random  offset, minus
one...
540 REM ...to base node held in t(n,3)
550 GOTO 100:  REM jump back to carry on
down tree
560 REM ------------------------------
570 REM .....multiple choice nodes.....
580 REM .....(t(n,1)=6)  jump here.....
590 REM ------------------------------
600  n=(t(n,3)-1)+c(t(n,2)):  GOTO  100:
REM add value of condition...
610  REM  ...held in element of c  array
pointed to by t(n,2) to...
620  REM  ...base node number  (held  in
t(n,3)) minus 1 then carry on down tree
630 REM ------------------------------
640 REM ...procedure nodes (t(n,1)=7)..
650 REM ..........jump here............
660 REM ------------------------------
670  GOSUB  840:  REM jump  to  relevant
procedure via procedure jumpblock
680  GOTO 100:  REM new node number  has
already been assigned during...
690 REM ...the procedure,  so return  to
carry on down tree
700 REM
710 REM ################################
720 REM action terminal node jumpblock
730 REM ################################
740 REM
750 REM (one entry only here)
760 ON t(n,2) GOSUB 780
770 RETURN
780 CLS: RETURN
790 REM
800 REM ################################
810 REM ......procedure jumpblock......
820 REM ################################
830 REM
840 ON t(n,2) GOSUB 860,890,910,930,950
850  RETURN:  REM jump back to carry  on
down tree
860  PRINT  m$(t(n,4));:  INPUT  i$:  IF
(i$()"Y")  AND  (i$()"y")  THEN  c(1)=0:
GOTO 880
870 c(1)=1
880 n=2: RETURN: REM jump back and carry
on down tree starting at node 2
890  PRINT  m$(t(n,4));:  INPUT  i$:  IF
```

(listing continued on page 55)

ONLY THE BRAVEST FLY....

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(continued from page 53)

random number within a particular range of intergers, in this case 1 to 3. It then, adds that number to the lowest node number, here 10, minus one to detemine which node to jump to next.

As you can see, there are now seven differnt types of node to deal with — you can see which ones are which in figure 2 as they've been labelled according to the key in the diagrom. We're now going to program this tree in Basic to show you exactly how it's done — and it really couldn't be easier. Take a look at the program listing and then read through the following notes.

First we initialise three different arrays to hold data for our tree, for the conditions that will be initialised by nodes one and eight, and for the different messages that will be printed. This is done in lines 50 to 70.

Data for the tree

Next, we enter the data for our tree. The table shows the different items that need to be recorded for each node, and figure 2 shows, alongside each node, the data that needs to be entered for it. Node number 5, for example, has the figures 7,4,0,5 beside it, and if you refer to the table you can see that this means that:

1) This node is a " procedure node", type 7
2) It calls procedure number 4
3) It will result in the printing of message number 5.

This data is read into the array t(17,4) in line 90.

Having set up the tree array and the message array, we now proceed directly to traversing the tree. The code number is held in the variable n, and since we want to start at node 1, this is set accordingly in line 170.

Line 180 then checks the first data item for that node (t(n,1) to find out what type of node it is — terminal, message, or whatever. The program then jumps to the correct routine. A choice node, for example, checks the value of the relevant condition in the c array which will be pointed to by t(n,2).

The program is heavily Remmed in this section to help you see what's going on, so I shan't waste sapce by repeating what's already there. Note, by the way, that you can delet the Rem lines if you really want to — there are no jumps to Rem lines in the program.

By checking each node in turn, the program traverses the tree, printing messages, getting inputs, and jumping to the appropriate nodes until it reaches a terminal node. If you want to see exactly what's going on, amend line 180 to read:

```
180 PRINT "I am now at
node";n; ON t(n,1) GOTO
220,320,370,450,510,600,670.
```

and you'll see the program actually moving down through the tree node by node. You can also make this amendment for debugging purposes if the program doesn't seem to be doing what you want it to.

There are a couple of other points to note about this listing. All actions and procedures called by the program are vectored via jumpblocks in lines 760 and 840. The reason for this is that when we come to design some really complex trees in the next issue for our character handler, this is the program structure we shall adopt.

The second thing to note is the way the program is carefully divided into sections. With a small tree such as the one we are dealing with here, this may seem to make the program unnecessarily long, but again, when we come to develop more complex routines, we shall be splitting up the program in a similar way.

Next month, we shall present a complete example of the use of this method in producing a fully-fledged character handler.

A certain degree of efficiency has been sacrificed in this listing to make it compatible with a large range of micros. However, some changes will still need to be made by owners of BBC, Spectrum, and Commodore computers. These are listed here:

BBC

```
1050 r=RND(r): RETURN
```

Commodore

```
780 PRINT "<SHIFT/CLEAR>":
RETURN
```

Spectrum

```
70   DIM m$(13,40)
180  RESTORE 2000: FOR x = 1 TO
     t(n,1): READ y: NEXT x: GOTO y
760  GOSUB 780
840  RESTORE 2100: FOR x = 1 TO
     t(n,2): READ y: NEXT x: GOTO y
1050 LET r=INT(rnd*r)+1: RETURN
2000 DATA 220,320,370,450,510,600,
     670
2100 DATA 860,890,910,930,950
```

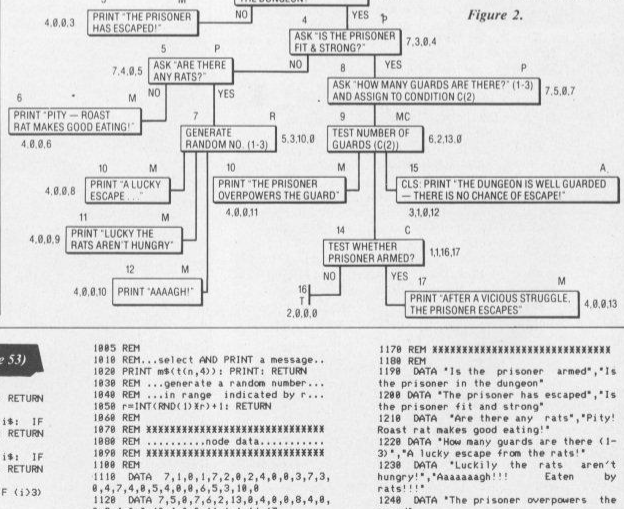


Figure 2.

(listing continued from page 53)

```
(i$<)*Y*) AND (i$<)*y*) THEN n=3: RETURN
980 n=4: RETURN
910  PRINT  m$(t(n,4));:  INPUT  i$:  IF
(i$<)*Y*) AND (i$<)*y*) THEN n=5: RETURN
920 n=8: RETURN
930  PRINT  m$(t(n,4));:  INPUT  i$:  IF
(i$<)*Y*) AND (i$<)*y*) THEN n=6: RETURN
940 n=7: RETURN
950 PRINT m$(t(n,4));: INPUT i: IF (i>3)
OR (i<1) THEN 950
960 c(2)=i: n=9: RETURN
970 REM
980 REM ************************************
990 REM          subroutines
1000 REM ************************************
1005 REM
1010 REM...select AND PRINT a message..
1020 PRINT m$(t(n,4)): PRINT: RETURN
1030 REM ...generate a random number....
1040 REM ...in range  indicated by r...
1050 r=INT(RND(1)*r)+1: RETURN
1060 REM
1070 REM ************************************
1080 REM ..........node data...........
1090 REM ************************************
1100 REM
1110  DATA  7,1,0,1,7,2,0,2,4,0,0,3,7,3,
0,4,7,4,0,5,4,0,0,6,5,3,10,0
1120  DATA 7,5,0,7,6,2,13,0,4,0,0,8,4,0,
0,9,4,0,0,10,4,0,0,11,1,1,16,17
1130 DATA 3,1,0,12,2,0,0,0,4,0,0,13
1140 REM
1150 REM ************************************
1160 REM ......... message data.........
1170 REM ************************************
1180 REM
1190  DATA "Is the  prisoner  armed","Is
the prisoner in the dungeon"
1200 DATA "The prisoner has escaped","Is
the prisoner fit and strong"
1210  DATA  "Are there any  rats","Pity!
Roast rat makes good eating!"
1220 DATA "How many guards are there (1-
3)","A lucky escape from the rats!"
1230  DATA  "Luckily  the  rats  aren't
hungry!","Aaaaaaaagh!!!  Eaten  by
rats!!!"
1240  DATA "The prisoner overpowers  the
guard"
1250 DATA "The dungeon is well guarded -
there is no hope of escape..."
1260  DATA "After a vicious struggle the
prisoner escapes!"
```

Chess

John Dawson checks out chess.

There's a false mythology about chess; you don't have to be a genius to play well and enjoy hours of concentrated excitement. Indeed, genius in one field is no indicator of brilliance in another. Alan Turing, probably the most brilliant mathematician involved in breaking the German ENIGMA cipher during the Second World War, is said to have been "an absolute duffer" at playing chess.

However, with the development of microcomputer chess programs and portable sensory chess sets, you don't even need a human opponent. This has the great advantage that when you are losing you can simply switch off the thing that's wiping the floor with you.

The programs and chess computers in table 1 actually play chess, generally according to the rules, and generally they are capable of beating you, unless you are a regular player with some experience. Some of the programs will offer you a good game at quite a high level of competence.

The **Chess King Pocket Micro** set is the only one of the four dedicated machines that does not have a "sensory" board. Instead, moves are keyed into the computer using the six keys at the bottom of the computer panel.

These keys shift automatically between the letter and the number depending upon whether you are entering the first or second co-ordinate of a piece's position. The other four keys control the level at which the machine plays LV, make the machine play the next move MO, and clear an incorrect entry CE before it is entered into the program EN.

Clearly the Chess King's input/output is greatly simplified compared to the multiplexed eight column by eight row input and 16 light emitting diodes — LEDs — output in the other three machines. This simplicity is reflected in the Chess King's single chip and simple printed circuit board.

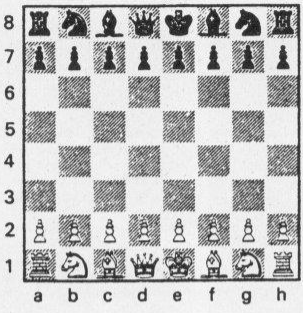


Figure 1: The opening position of all the pieces.

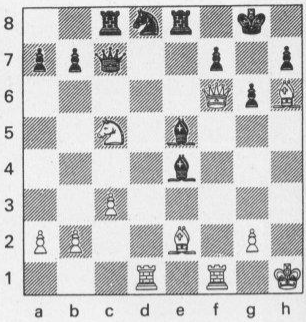


Figure 2: Part of the Chess King instruction manual.

The board folds in two and makes a neat package in a soft plastic case about 19.5 by 6.5 by 2.5 cms. Battery life is said to be about 400 hours and there is a recessed on/off switch on the side of the case. The pieces on the board are punched from a strip of magnetised plastic. There are no spare pawns or Queens which makes life unnecessarily difficult if you, or the machine, succeed in promoting or exchanging a pawn for a Queen or another piece in the course of the game.

The CGL GrandMaster program was written by White and Allcock Ltd but the manual for the Chess King does not state the origin of the machine code held in the chip. It is a limited program both by the standards of the other machines and the software for the BBC, QL and Amstrad computers.

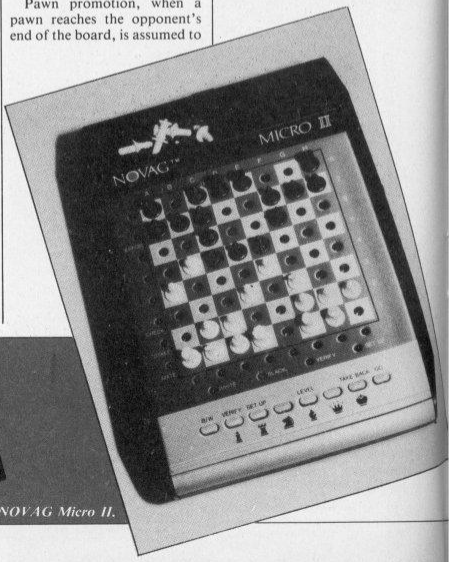
The Chess King has only four levels of play and, while the number itself is comparatively unimportant, the highest — strongest — level allows the machine only eight to 24 seconds on average to formulate its next move.

Pawn promotion, when a pawn reaches the opponent's end of the board, is assumed to be to a Queen while the rules permit the player to choose to promote the pawn to a Queen, Rook, Bishop or Knight. Switching the machine off erases the current game and the Chess King sets up a new game automatically when switched on.

Probably the most important failing in the Chess King is the inability to verify where all the

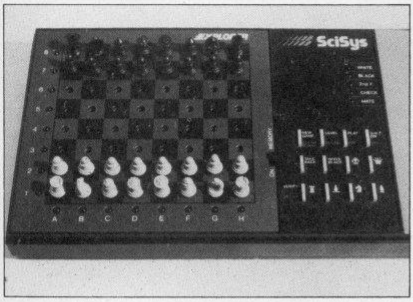
Table 1:

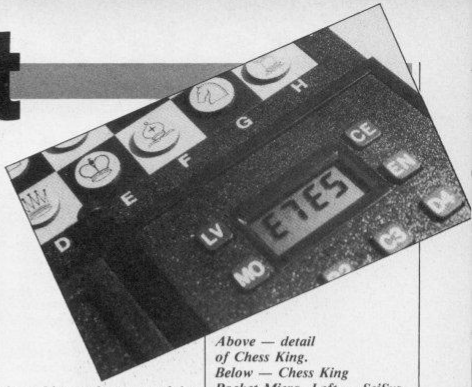
Micro II	NOVAG	Hong Kong
Explorer	SciSys	Hong Kong
Chess King	Computer Games Ltd	England
Grandmaster	Computer Games Ltd	England
White Knight Mk 11/12	BBC	UK (BBC)
Cyrus II	Amsoft	UK (Amstrad)
3D Voice Chess	CP Software	UK (Amstrad)
QL-Chess	Psion	UK (QL)
Colossus Chess 4.0	CDS Software Ltd	UK (Commodore 64)



NOVAG Micro II.

check-out





Above — detail of Chess King.
Below — Chess King Pocket Micro. Left — SciSys Explorer.

pieces on the board are placed in the computer's memory. Nothing is more frustrating than setting up a devious trap only to find that the machine couldn't care less because it thinks one piece is somewhere else entirely.

There is no way to take back a move nor to review the moves that have been made other than by writing them down as you go along. However, at £22.95 in North Oxfordshire it is the cheapest dedicated machine to be found and it is very portable.

The **NOVAG Micro II** also uses a single chip to hold the program and play the game. The chip is a traditional 40 pin integrated circuit and figures 4 and 5 show the printed circuit board with the output LEDs and the two plastic membranes that form the sensory board.

A move is made on a sensory by pressing the piece into its socket until two LEDs light up to indicate the current row and column — rank and file in chess terminology — of the piece.

The piece is removed from its socket and pressed down into the new location until the computer beeps to indicate that the move has been accepted. The computer's move is indicated by lights in the same way, the position of the piece to be moved is indicated and when it has been depressed the destination co-ordinates light up.

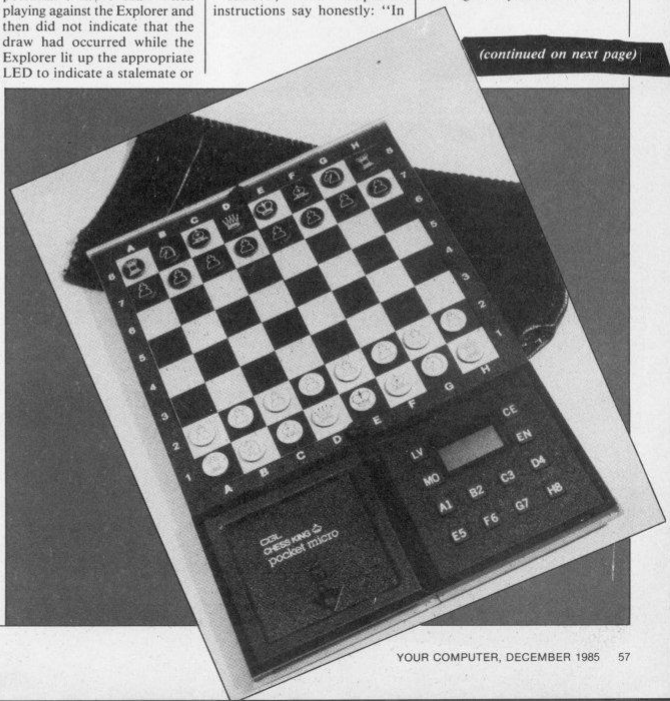
The NOVAG Micro II is 7 by 5 by 1.5 ins. in size and shares several of its functions with the **SciSys Explorer** chess computer. The Explorer machine is 7.5 by 4.5 by 1.5 ins. and is the most sophisticated of the three dedicated computers. Figure 3 sets out the hardware configuration and software specification for the various machines and programs.

The Micro II failed to spot a potential 3 move draw when playing against the Explorer and then did not indicate that the draw had occurred while the Explorer lit up the appropriate LED to indicate a stalemate or draw. I have taken none of the machines through the series of repetitions necessary to provoke a draw according to the 50 move rule but as all the machines are unable to take back more than four half moves at best — the Explorer can backstep through two White/Black moves at some stages of the game — it seems unlikely that any of the machines has the capacity to detect a sequence of 50 identical moves.

Indeed, the Explorer instructions say honestly: "In the case of a stalemate or draw by immediate threefold repetition, only the Mate light will be turned on"; by implication excluding the possibility of a 50 move draw.

The SciSys Explorer has both the best program and the best design of the machines I have looked at. The Explorer predicts what your next move is likely to be and then thinks while it is waiting for you to move of

(continued on next page)



Chess check-out

(continued from previous page)

what's the best reply it can make. Neither the Micro II nor the Chess King do this and clearly it increases the power of the program considerably.

Colossus 4.0 and **QL-Chess** both think in their opponent's time and you can turn off this feature which makes the program weaker; that's to make you feel even smaller when you lose the 10th successive game. The compartment on the right hand side of the Explorer board holds the spare pieces safely, a good range of functions are given by the "function" keys, three AA cells provide more than 100 hours use and the machine will store the state of a game for up to one year when the power switch is turned to "memory".

The SciSys machine has a good set of standard opening moves — the "book" — which it plays quickly and decisively so long as your responses match its expectations. Unlike some early chess programs, the Explorer seems to have no trouble moving from its openings book to the middle game. Most chess computers are comparatively weak — by good players' standards — when the majority of pieces have been captured and the war on the board enters the "endgame".

Martin Bryant wrote **White Knight Mk 11** and **Mk 12,** and is responsible also for the Commodore 64 program Colossus Chess 4.0. The instructions for the programs are very similar and clearly the architecture of the software is a progression from one program to the next.

There is an interesting series of comparisons in the back of the instructions for Colossus Chess 4.0 between microcomputer chess programs for the Apple II, Spectrum, Atari, Dragon, Electron, Oric and ZX-81 computers. Colossus 4.0, running on an Apple II, beat everything in sight including both versions of Colossus is supplied with a number of demonstration games for tutorial purposes.

The **QL-Chess 3D** display is a lot of fun and, like Martin Bryant's programs, plays a good strong game of chess. However, the plan view provided in Colossus 4.0 and the White Knight series is clear and gives unequivocal information about the state of the game.

CONCLUSIONS

The dedicated chess machines have some real advantages over either another human player or a program running on a microcomputer.

- You can learn by playing just some of the moves of a game over and over again. I have found it very instructive to see how the Explorer deals with the first 10 or a dozen moves. Very few human opponents will put up with so selfish an approach.
- The real pieces in the NOVAG and SciSys machines give a true perspective and allow you to 'walk round' the board in a way that even the best 3D programs cannot simulate yet.
- You can play chess on a train or bus, at the seaside, anywhere you like with one of the dedicated machines.

Conversely, the chess programs may suffer from being too strong for many beginners even at the lower levels of play. One form of handicapping that used to be popular was for the stronger player to give the other one or more pieces at the start of the game.

The machines and programs with a Set-up mode allow you to take away a Rook or some other piece from the computer before the game starts. Colossus 4.0 also allows you to handicap the computer by cutting down the time available for it to compute its moves.

Either a dedicated chess computer or one of the programs could make a really long lasting Christmas present. But the machine and its instructions alone are not sufficient unless there is a good chess player in the same household.

The SciSys Explorer is the best of the sensory chess computers that I have seen. It's available from Dixons or, in a different colour scheme, from Tandy.

Figure 3.

Software/Machine	NOVAG Micro II M	SCISYS Explorer M	CGL Chess King M	CGL GrandMaster M	BBC White Knight S	AMSOFT Cyrus II S	CP SOFT 3D Voice S	CDS SOFT Colossus S	PSION QL-Chess S
MACHINES									
Sensory	YES	YES	NO	YES					
Battery life	20 hours	100 hours	400 hours	not known					
Main power	YES	NO	NO	not known			£12.95		
Price	£39.95	£39.95	£22.95	£54.95	£12.95				
SOFTWARE									
Levels/Modes	8	9	4	not known	many			many	22 (36)
Minimum time	'Instantly'	2 seconds	5-11 secs		'0 seconds'			'0 secs'	2 secs or less
Maximum time	5-20 mins	2 hours	8-24 secs		very large			very large	'infinite'
Time equality									
Tournament mode							'7 moves'	12 ply	not stated
max. depth of search	not stated	not stated	not stated	not stated	unnecessary	unnesessary	unnecessary	unnecessary	unnecessary
verify pieces	YES	YES	NO	YES	YES	YES	YES	YES	YES
Set up pieces	YES	YES	NO	YES	YES			YES	YES
Force program move	NO	YES	NO	not known	YES (120 max)	YES	YES	YES (120 max)	YES (to start)
Take back move	YES (2)	YES (2-4)	NO	YES	NO	NO	NO	NO	YES
Analysis	NO	NO	NO	NO	YES	YES	YES	YES	YES
Clock times	NO	YES	NO	NO	(YES Mk 12)	NO	NO	YES	YES
Save state of game	NO	NO	NO	NO	NO	NO	NO	NO	YES
Print moves	NO	NO	NO					YES	YES
Replay game	NO	NO	NO					YES	YES
Backstep game	NO	NO	NO					YES	YES
Player v Player	NO	YES	NO					YES	YES
3D display	real pieces	real pieces	counter pieces	real pices	2D plan view	3D display	3D display	2D display	2D/3D display
RULES									
Stalemate	YES	YES	partial	YES	YES			YES	YES
Draw	NO	3 move	NO		YES			YES	YES
En passant	YES	YES	YES	YES	YES	YES	YES	YES	YES
Castling	YES	YES	YES	YES	YES	YES	YES	YES	YES
Underpromotion	YES	YES	NO	YES	YES	YES	YES	YES	YES
Lose 'on time'	NO	NO	NO	NO	NO	NO	NO	NO	NO

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Sampling

H-n-n-nineteen eighty five has been the year of the sampler. Now you can imitate the effects as Tony Sacks reports.

Have you ever wanted to conduct the Berlin Philharmonic Orchestra? Or to have Mark Knopfler play for you in your living room? Well, these and a thousand other fantasies can now come true through the miracle of sampling.

All you need is a micro, a box of electronics and matching software, and you too could be producing some of the dramatic effects that pepper the works of Duran Duran, the Thompson Twins, Paul Hardcastle, and many other contemporary musicians.

The theory of sampling is simple. You take a sound — either from a microphone or directly from your hi-fi or an electronic instrument — and chop it into lots of tiny segments, each usually lasting less than one-thousandth of a second. These segments are then digitised and tucked away in the recesses of you micro's memory.

When you want to play back the sound you squeeze the digitised data back through a digital-to-analogue converter to reconstitute the sound and send the signal to an amplifier. All being equal, you should get a recognisable rendition of your original sound blasting out of the loudspeaker.

If the hardware is well designed, the quality of a sampled sound is determined largely by the rate at which the original sound was chopped into segments — and hence the size of the segments. This rate is known as the sampling frequency. As a rule of thumb, the sampling frequency should be twice the highest frequency you want to hear, so that to hear a frequency of 15kHz — towards the top of the audible range — you would need to sample at 30kHz or higher.

So far, so good. But the higher the sampling frequency, the quicker your micro's limited memory is gobbled up, and the shorter the sample will last. For example, Supersoft's Microvox sampler for the Commodore 64 will give you less than a second of sampling time at its maximum sampling frequency of 42kHz.

This may be sufficient for short percussive sounds but when you want to sample a sound like a piano which may take several seconds to die away, you've got problems.

There are two possible solutions. First you can reduce the sampling frequency which means that you will lose some of the higher frequencies in the sampled sound. This may or may not be noticeable, depending on the sound, but it will give you a longer sample. The Microvox, for example, provides a maximum sample length of 17.4 seconds at a frequency of 2kHz.

The second approach is to sample at a high frequency but to use some nifty software to doctor the playback. If, immediately after reading the sampled sound out of memory, all or part of the sample is re-read, you can give the impression of an extended sound. This trick, called looping, can be repeated to give a continuous sound. Some samplers will even decrease the amplitude of the output gradually to give the impression of a sound dying away

You may not be aware of it, but many of the percussion sounds on recent rock records are the work, not of sweating musicians but of electronic "drum boxes" pumping out sampled sounds.

Percussive sounds are ideal for sampling because they tend (with some notable exceptions) to be rather short-lived and to have limited bandwidths. Individual sounds can thus be squeezed into relatively small chunks of memory and several different sounds can co-exist in a micro's memory.

It is not surprising therefore that among the first batch of sampling products for micros are two drum simulators. What is more surprising is that whereas dedicated drum machines cost several hundred pounds each, the two micro-based packages, for the Commodore 64 and the Spectrum, cost just £65.00 and £29.95 respectively, and yet produce stunningly realistic and powerful sounds.

As with the other sampling systems described on these pages, the sounds produced by these drum simulators are digital recordings of real sounds. Their quality bears no relation to the types of sounds you are used to from your micro's internal sound system. They have to be heard to be believed.

But unlike the other sampling systems, these packages do not allow users to produce their own samples. Instead the suppliers provide ready-sampled sounds on disc or cassette together with the software to combine these sounds rhythmically, and a relatively simple digital-to-analogue hardware decoder.

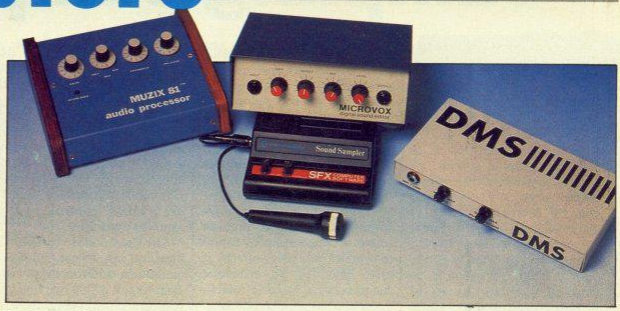
The Commodore drum machine, called the Syntron Digidrum, was developed in the Netherlands and is being distributed in Britain by Syndromic Music. The Spectrum package, dubbed the Specdrum, is a home-grown product from Cheetah Marketing and is being sold only by Boots. An Amstrad version, expected to sell for around £35.

Although the two drum simulators are not strictly rivals — unless you don't own either a Spectrum or a Commodore — it is interesting to compare the approaches adopted by the two design teams.

In many ways the two systems are very alike. Both squeeze eight different percussive sounds into the sampling memory. Both allow up to three of these sounds to be played back simultaneously but restrict the choice to one sound from each of three groups. Both provide a grid display for the user to construct rhythm patterns, and both allow

Above right: Muzix-81, Microvox, SFX and DMS.
Below: SFX in greater detail

samplers



naturally.

Looping is just one of many ways is which the sampled sound can be manipulated once it is in a micro's memory. The most obvious of these is to change the read-out frequency. If you read out the data at twice the sampling frequency you will get the same sound an octave higher — and lasting half as long. Similarly, halving the read-out frequency will drop the sound by an octave. Intermediate frequencies produce intermediate notes.

Most samplers allows you to select limited portions of the sampled sound for playback or manipulation. Using this facility, you can pick out the solo flute sound in the middle of a sampled orchestral flourish, for example. It also means that part of as sample can be repeated several times to give Paul Hardcastle's stuttering "n-n-n-nineteen" effect.

Some samplers provide real-time effects to produce doctored versions of the original sound almost instantaneously. For example, by playing back a sound just after it has been fed into the sampler, a variety of effects such as echoes and reverberation can be generated, depending on the length of the delay.

Another popular real-time effect is to shift the pitch of the playback sound. If you treat your voice in this way, you can make yourself sound incredibly butch — or, if you prefer, give yourself a falsetto. It is even possible to perform a duet with yourself.

The £249.95 ZX-81 sampler, called **Muzix-81**, was developed by a pair of Hungarian musician-boffins and is being distributed in the UK by Vulcan Electronics. It turns out that the ZX-81's relatively simple internal architecture lends itself to sampling although its memory has to be boosted by the addition of a 64K Rampack. This gives it a 1.6 second maximum sample length at a very respectable 37kHz sampling frequency.

The quality of the sounds produced, and the facilities offered by the Muzix-81 rival those of the best of the Commodore-based systems. Indeed it has one very useful command not offered on the CBM samplers. This automatically looks for matching segments of sound during a looping operation to make the joins almost inconspicuous.

Where the Muzix-81 does fall down is in the diabolical keyboard and limited graphics capabilities of the ZX-81. The graphics limitations are especially apparent when the Muzix-81 tries to produce an oscilloscope-type display of the sampled sound.

These displays, common to all of the sampling packages, help the user to visualise the sound and to select looping points. Not surprisingly, the Commodore-based samplers do a much better job than the ZX-81. These relatively minor problems should be overcome in a Spectrum version of the Muzix-81, due soon.

Another possible drawback to the Muzix-81 is that it has to be controlled by an analogue synthesiser. Before the digital age dawned with synthesisers commonly used an as all recent analogue control system in which an increase in one volt would produce a one octave rise in pitch. The Muzix-81 is designed to be driven by such a synthesiser which you could probably pick up fairly cheaply on the second-hand market, but electronic musical equipment is geared to MIDI, this seems a retrograde step.

One sampler which does allow for control from a MIDI keyboard is Supersoft's £225 **Microvox** package for the Commodore 64. This is a well thought-out sampler with a wealth of facilities — as its price would indicate.

In addition to versatile and easy-to-use sample-taking and manipulating controls, the Microvox includes a real-time delay effects section and a "sequencer". This allows you to record, and subsequently edit, a series of single notes played on a MIDI keyboard in real time. These notes can be

series of these patterns to be linked together to form "songs".

However, there are distinct differences between the two systems. The Digidrum has been designed to maximise the amount of memory available for sample storage, sometimes at the expense of user-friendliness.

The Specdrum designers have devoted a greater proportion of the micro's memory to the control program, with the result that it is easier to use and slightly more versatile than the Digidrum. The price they pay is slightly inferior, but still perfectly acceptable, drum sounds.

One particular attraction of the Specdrum not available on the Digidrum, is the option of real-time programming. Both systems allow you to enter drum patterns, in your own time, as points on a time-v-instrument grid, but, at present, only the Specdrum allows you to tape out the rhythms on the computer keyboard and have these entered automatically on the grid. For many people, this more intuitive approach is preferable. The Digidrum designers are said to be working on a real-time version of their sytem.

There are differences too on the hardware front. The Digidrum has a socket which pumps out timing pulses for external devices such as synthesizers and dedicated drum machines suitably equipped to follow its timing instructions.

The Specdrum prefers to take its orders from the outside world and will synchronise its activities with signals fed through the EAR socket of the Spectrum. This allows it to stay in time with instruments recorded on different tracks of a multi-track tape recorder, for example.

Sampling systems such as the Specdrum and Digidrum are only as good as the sampled sounds supplied for them. Both systems come with a useful assortment of sounds — the Specdrum having a basic "kit" of eight and two alternative sounds; the Digidrum having two full kits, one conventional, the other made up of tinkly, butt effective, glass sounds.

Both also include a variety of rhythm patterns and "songs", which serve the dual roles of demonstration pieces and instructive examples of the programming art.

Sooner or later you will probably tire of the original set of sounds, so both suppliers are wisely planning to support their systems with further sampled sounds on disc and/or cassette. The first back-up set of more than 40 new sounds for the Digidrum is already available at a cost of £16.50.

(continued on next page)

Sampling samplers

(continued from previous page)

stored as up to 24 different "pattern" which can be linked together to form a "song".

The sampler allows you to store simultaneously up to 16 different sampled sounds, or "voices", provided that there is enough memory. The sequencer can be instructed to play different notes using different voices, thus adding to the richness and the variety of the output. It can, for example, be used to simulate a set of percussion instruments, and a "kit" of sampled drum sounds is provided as part of the Microvox software.

The Microvox's almost total reliance on MIDI for control is both a strength and a weakness. The main drawback is for would-be users who do not possess a MIDI keyboard and cannot afford the £500-plus cost of a keyboard and sampler.

For such people a slightly cheaper alternative exists in the form of the £199 **Digital Music System** — DMS — from Microsound. In addition to MIDI, this system also offers the options of controlling the sampler either from the Qwerty keyboard — possibly using a clip-on miniature musical keyboard such as those from Commodore or Siel — or from the company's own £99 full-size, four-octave musical keyboard.

The DMS allows the user to select a sample rate of between 4kHz — which gives 8s of barely recognisable sound — and 33kHz — which produces 1s of high quality sound. It does not offer any real-time effects, but does include a modulation source which can be used to tinker with the sampled sound to produce interesting effects. It also provides an envelope function with variable attack, decay and sustain characteristics to shape the sampled sound.

The DMS and Microvox samplers are aimed, both in quality and price, at the serious musician. But a pair of Commodore-based samplers at a more accessible price for the less dedicated experimenter, should be on the market by the time you read this.

The first of these is from Commodore itself. It is a product of the company's collaboration with Music Sales which has resulted in sophisticated software for the SID chip and the £100 Sound Expander synthesizer add-on for the CBM-64/128.

The £69.99 **Commodore Sound Sampler** comes complete with a microphone and plugs into the cartridge port of the 64 or 128. A useful option not provided with other samplers is the possibilty of playing back the sampled sounds through a television speaker; the other systems rely on you having an amplifier close to your micro. An optional £24.99 MIDI adaptor can be plugged into the Commodore sampler module to give MIDI control of the sampled sounds.

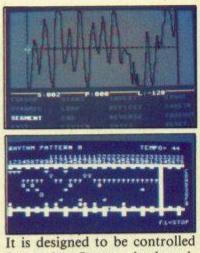
The Commodore software is based on easy-to-use pull-down menus. In additon to straight sampling, it offers two types of real-time effect: delays from 20 milliseconds to 2 seconds; and pitch transposition of up to an octave above or below the original sound.

Four different short sounds can be stored simultaneously and played back using a very rudimentary sequencer. As with Supersoft's Microvox, this facility is used to simulate a drum machine and two four-instrument sampled drum kits are provided as part of the software, Unfortunately, the Commodore's 16-note "sequencer" is such a basic affair that it is little more than a gimmick.

Although the Commodore sampler does offer very good value for money, it is clear that some corners have been cut to achieve this. For example, there is no choice of sampling frequency, the fixed rate being at 20kHz, providing samples up to 1.4 seconds long. The resulting sounds, although good, are not quite up to the standard of the sampler's more expensive rivals.

Even cheaper than Commodore's sampler is the £49.99 **Digital Sound Sampler** from Datel. Earlier this year Datel brough out a sampler for the Spectrum which was little more than a toy, producing sampled sounds of rather poor quality and offering a minimum of functions. The company claims that the Commodore version is a vast improvement, with better designed electronics and software written in machine code, not Basic as was used of the Spectrum version.

The Datel sampler, which was not yet available for review as we went to press, provides a variety of real-time effects and includes a step-time sequencer.

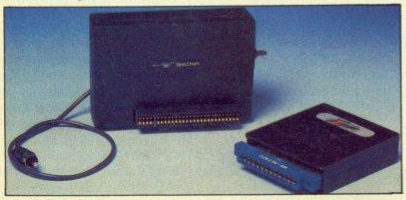


It is designed to be controlled from the Qwerty keyboard, possibly using a clip-on musical overlay.

The possibility of MIDI control was looked at but discarded on cost grounds. But as a spin-off, Datel plans to produce a separate MIDI interface which will be sold as a package with MIDI real-time and step-time recorders at the remarkable price of £39.95 — less than half the price of some existing CBM-64 MIDI interfaces!

In many respects, the **DS:3** for the Apple II is like its less costly counterparts, but it does have one significant advantage. Whereas the other samplers we have looked at are all monophonic — only one sound can be played back at a time — the DS:3 is polyphonic, allowing up to four notes to sound simultaneously.

Microvox digital sound editor.



The SpecDrums.

Sampler suppliers.

Cheetah Marketing, 1 Willowbrook Science Park, Crickhowell Road, St. Mellons, Cardiff (0222-777337)

Commodore Business Machines, Corby, Northamptonshire NN17 1BR (0536-205252)

Datel Electronics, Unit 8, Fenton Industrial Estate, Dewsbury Road, Fenton, Stoke-on-Trent (0782-273815)

Greengate Productions, Unit D, Happy Valley Industrial Park, Primrose Hill, Kings Langley, Hertfordshire WD4 8HZ (09277-69149)

Microsound, PO Box 14, Petersfield, Hampshire GU32 1HS (0703-87403)

Supersoft, Winchester House, Canning Road, Wealdstone, Harrow HA3 7SJ (01-861 1166)

Syndromic Music, 35A Grove Avenue, London N10 2AS (01-883 1335)

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Cuthbert In The Cooler 26-7363	£7.95
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Interrupt-driven

Many popular video games nowadays have music ringing in the background during play. The Amstrad CPC-464 computer has some excellent facilities for sound generation but attempting to add background music to a Basic program using the Every instruction generally gives poor results with the game being slowed down considerably.

The assembly language program presented here allows interrupt driven background music to be added to Basic programs through the use of some simple RSX-Resident System extension-commands. It also allows the us of one, two or all three sound channels.

The following commands are provided. Note that each one must be preceded by a vertical bar (Shift '@') symbol. A parameter enclosed in square brackets is optional.

(1). MUSICON ,t, a1 (,a2) (,a3) — turn on music. where t is the tempo (the length in fiftieths of a second, of the shortest available note) and a1,a2 and a3 are two less than the addresses of the data for channels 1,2 and 3 respectively.

(2). MUSICOFF — turn off music.

(3). VOLUME v,1 (,v2) (,v3) — set for channel (s), where v1, v2 and v3 are the respective amplitudes of channels 1,2 and 3.

(4). PAUSE — stop playing music.

(5). CONTINUE — continue playing music after pausing.

To enter the program, you can either enter and assemble the source code — listing 1 — using an assembler. I have used Devpac but any good one should do). Or if you do not have an assembler I have provided a Basic loader program — listing 2 — which should be typed in and Run to store the code in memory.

Once the code is in memory, it can be saved on tape (or disc) using the command

SAVE "MUSIC",B,&A000,&2A0 (enter)

To make the computer recognise the new commands the instruction CALL &A1C5 should be given. At this point the program can be tested by entering and Running listing 3 which tells the computer to repeatedly play all the notes available until a Musicoff command is given.

Any program using the extension commands should include the following line to load the code and log-on the commands MEMORY &9FFF: LOAD "!MUSIC":CALL&A1C5

The data for the music to be played through a channel is arranged as follows:-

byte 1 — duration of note 1 (1-127), byte 2 (upper nybble) — note 1 octave (0-5), byte 2 (lower nybble) — note 1 number (0-11), byte 3 — duration of note 2, byte 4 (upper nybble) — note 2 octave, byte 4 (lower nybble) — note 2 number....., 0

Once the music playing routine discovers the 0 in place of a duration number it then loops back to the beginning again. If bit 7 of the duration number is

Listing 1.

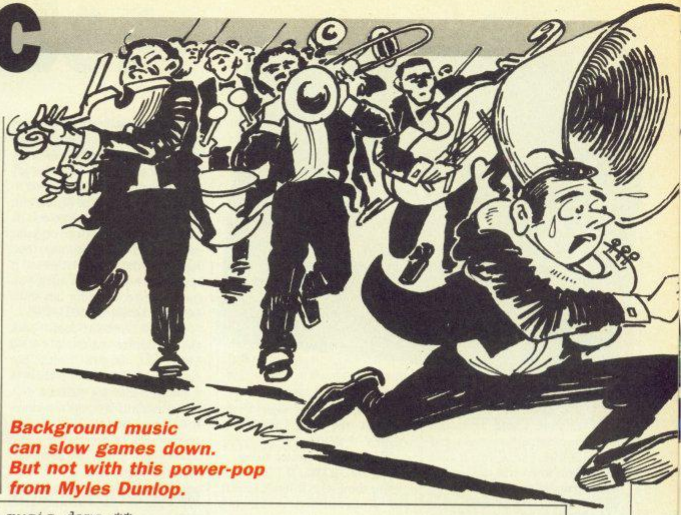
```
10 ; Amstrad background music
20 ; (c) 1985 Tyne Publ.Co
30 ;
40          ORG  &A000
50 TICKER:  DEFS 6
60 LBLOCK:  DEFS 7
70 POINTR:  DEFS 6
80 DELAY:   DEFS 3
90 DATA:    DEFS 6
100 NCHAN:  DEFS 2
110 TEMPO:  DEFW 0
120 VOLUME: DEFS 3
130 DEL:    DEFW 0
140 MUSON:  CALL RESNF
150         CALL RESSND
160         LD   C,&0
170         LD   A,7
180         CALL &BD34
190         LD   HL,LBLOCK
200         LD   B,&29
210         LD   DE,MUSIC
220         CALL &BCE1
230         LD   HL,TICKER
240         LD   DE,&30
250         LD   BC,(TEMPO)
260         CALL &BCE7
270         RET
280 MUSOFF: LD   HL,TICKER
290         CALL &BD0A
300         CALL &BCEC
310 RESSND: LD   D,&3
320 RESSN2: LD   A,7
330         ADD  A,D
340         LD   C,0
350         CALL &BD34
360         DEC  D
370         JR   NZ,RESSN2
380         RET
390 RESMP:  LD   HL,(DATA)
400         LD   (PDINTR),HL
410         LD   HL,(DATA+2)
420         LD   (PDINTR+2),HL
430         LD   HL,(DATA+4)
440         LD   (PDINTR+4),HL
450         LD   A,1
460         LD   (DELAY),A
470         LD   (DELAY+1),A
480         LD   (DELAY+2),A
490         RET
500 MUSIC:  LD   HL,DELAY
510         LD   BC,DATA
520         LD   DE,PDINTR
530         XOR  A
540         CALL MUSIC2
550         LD   A,(NCHAN)
560         CP   1
570         RET  Z
580         LD   A,1
590         INC  HL
600         INC  BC
610         INC  BC
620         INC  DE
630         INC  DE
640         CALL MUSIC2
650         LD   A,(NCHAN)
660         CP   2
670         RET  Z
680         LD   A,2
690         INC  HL
700         INC  BC
710         INC  BC
720         INC  DE
730         INC  DE
740         CALL MUSIC2
750         RET
760 MUSIC2: DEC  (HL)
770         RET  NZ
780         PUSH HL
790         PUSH BC
800         PUSH DE
810         PUSH AF
820         LD   (DEL),HL
830         LD   A,(DE)
840         LD   L,A
850         INC  DE
860         LD   A,(DE)
870         LD   H,A
880         INC  HL
890         INC  HL
900         LD   A,H
910         LD   (DE),A
920         DEC  DE
930         LD   A,L
940         LD   (DE),A
950         LD   A,(HL)
960         CP   0
970         JR   NZ,MUSIC3
980         LD   A,(BC)
990         LD   (DE),A
1000        INC  DE
1010        INC  BC
1020        LD   A,(BC)
1030        LD   (DE),A
1040        LD   A,1
1050        LD   HL,(DEL)
1060        LD   (HL),A
1070 MUSIC6: POP AF
1080        PUSH AF
1090        ADD  A,8
1100        LD   C,0
1110        CALL &BD34
1120 MUSIC4: POP AF
1130        POP DE
1140        POP BC
1150        POP HL
1160        RET
1170 MUSIC3: BIT 7,A
1180        JR   Z,MUSIC5
1190        RES  7,A
1200        LD   BC,(DEL)
1210        LD   (BC),A
1220        JR   MUSIC6
1230 MUSIC5: LD  BC,(DEL)
1240        LD   (BC),A
1250        INC  HL
1260        PUSH HL
1270        LD   A,(HL)
1280        AND  240
1290        SRL  A
1300        LD   E,A
1310        SLA  A
1320        ADD  A,E
1330        LD   E,A
1340        LD   D,0
1350        LD   HL,NOTDAT
1360        ADD  HL,DE
1370        LD   B,H
1380        LD   C,L
1390        POP  HL
1400        LD   A,(HL)
1410        AND  15
1420        LD   L,A
1430        SLA  E
1440        LD   H,B
1450        LD   L,C
1460        ADD  HL,DE
1470        POP  AF
1480        PUSH AF
1490        SLA  A
1500        PUSH AF
1510        LD   C,(HL)
1520        CALL &BD34
1530        POP  AF
1540        INC  A
1550        INC  HL
1560        LD   C,(HL)
1570        CALL &BD34
1580        POP  AF
1590        PUSH AF
1600        LD   HL,VOLUME
1610        LD   E,A
1620        LD   D,0
1630        ADD  HL,DE
1640        ADD  A,8
1650        LD   C,(HL)
1660        CALL &BD34
1670        JR   MUSIC4
1680 NOTDAT: DEFW &0777,&070C
1690        DEFW &06A7,&0647
1700        DEFW &05ED,&059B
1710        DEFW &0547,&04FC
1720        DEFW &04D4,&0470
1730        DEFW &0431,&03F4
1740 ;
1750        DEFW &03DC,&0386
1760        DEFW &0353,&0324
1770        DEFW &02F6,&02CC
1780        DEFW &02A4,&027E
1790        DEFW &0256,&0238
1800        DEFW &021B,&01FA
1810 ;
1820        DEFW &1DE,&1C3
1830        DEFW &1AA,&192
1840        DEFW &17B,&166
1850        DEFW &152,&13F
1860        DEFW &12D,&11C
1870        DEFW &10C,&FD
1880 ;
1890        DEFW &EF,&E1
1900        DEFW &D5,&C9
1910        DEFW &BE,&B3
1920        DEFW &A9,&9F
1930        DEFW &96,&8E
1940        DEFW &86,&7F
1950 ;
1960        DEFW &77,&71
1970        DEFW &6A,&64
1980        DEFW &5F,&59
1990        DEFW &54,&50
2000        DEFW &4B,&47
2010        DEFW &43,&3F
2020 ;
2030        DEFW &3C,&38
2040        DEFW &35,&32
2050        DEFW &2F,&2D
2060        DEFW &2A,&28
2070        DEFW &26,&24
2080        DEFW &22,&20
2090 ;
2100 ; add extension commands
2110 ;
2120 LOGRSX: LD  BC,COMTAB
2130        LD   HL,SPACE
2140        CALL &BCD1
2150        RET
2160 SPACE: DEFS 4
2170 COMTAB: DEFW NTABLE
2180        JP   MONRSX
2190        JP   MUSOFF
2200        JP   PAUSE
2210        JP   CONT
2220        JP   VOLRSX
2230 NTABLE: DEFW "MUSI"
2240        DEFB "C","O","N"+128
2250        DEFW "MUSI"
2260        DEFB "C","O","F","F"+128
2270        DEFW "PAUS"
2280        DEFB "E"+128
2290        DEFW "CONT"
2300        DEFB "I","N","U","E"+128
2310        DEFW "VOLU"
2320        DEFB "M","E"+128
2330        DEFB 0
2340 ;
2350 ; music-on
2360 ;
2370 MONRSX: PUSH AF
2380        PUSH IX
2390        CALL MUSOFF
2400        POP  IX
2410        POP  AF
2420        DP   2
2430        RET  C
2440        CP   5
2450        RET  NC
2460        LP   2
2470        JR   Z,MON5
2480        CP   1
2490        JR   Z,MON4
2500        LD   A,3
2510        LD   (NCHAN),A
2520        LD   L,(IX)
2530        LD   H,(IX+1)
2540        LD   (DATA+4),HL
2550        INC  IX
2560        INC  IX
2570 MON3:  LD   L,(IX)
2580        LD   H,(IX+1)
2590        LD   (DATA+2),HL
2600        INC  IX
2610        INC  IX
2620 MON2:  LD   L,(IX)
2630        LD   H,(IX+1)
2640        LD   (DATA),HL
2650        INC  IX
2660        INC  IX
2670        LD   A,(IX)
2680        LD   (TEMPO),A
2690        CALL MUSON
2700        RET
2710 MON4:  LD   A,2
2720        LD   (NCHAN),A
2730        JR   MON3
2740 MON5:  LD   A,1
2750        LD   (NCHAN),A
2760        JR   MON2
2770 ;
2780 ; PAUSE
2790 ;
2800 PAUSE: CALL RESSND
2810        LD   HL,LBLOCK
2820        CALL &BD0A
2830        RET
2840 ;
2850 ; CONTINUE
2860 ;
2870 CONT:  XOR  A
2880        LD   (LBLOCK+2),A
2890        RET
2900 ;
2910 ; VOLUME
2920 ;
2930 VOLRSX: CP  0
2940        RET  Z
2950        CP   4
2960        RET  NC
2970        CP   1
2980        JR   Z,VOL2
2990        CP   2
3000        JR   Z,VOL3
3010        LD   A,(IX)
3020        LD   (VOLUME+2),A
3030        INC  IX
3040        INC  IX
3050 VOL3:  LD   A,(IX)
3060        LD   (VOLUME+1),A
3070        INC  IX
3080        INC  IX
3090 VOL2:  LD   A,(IX)
3100        LD   (VOLUME),A
3110        RET
```

music

set (just add 128), then the note is a rest otherwise 1 is the shortest note available, 2 is twic as long, 3 is three times as long etc. The octaves available correspond to octaves −2 to +3 shown in the CPC-464 manual appendix VII and in the firmware manual appendix VIII. e.g. bytes 2,52 define a note of duration 2, octave 3, note 4; 129, 0 define a rest of duration 1. A simple formula for working ot the second byte of a note is therefore:

byte stored = 16*octave + note

If you do not wish to type in the program I can supply copies of it on cassette for £4 each. Please include a 24 pence SAE. Write to: M.B.L. Dunlop, 19 Droridge, Dartington, Totnes, Devon, TQ9 6JG.



Background music can slow games down. But not with this power-pop from Myles Dunlop.

```
10 REM ** background music demo **
20 REM ** By Myles Dunlop        **
30 REM
35 CLS:PRINT"Please wait..."
40 MEMORY &9FFF:LOAD "!",&A000:CALL &A1C5
50 a=&A300:GOSUB 1000
60 a=&A380:GOSUB 1000
70 |VOLUME,15,15
80 |MUSICON,10,&A300-2,&A380-2
90 MODE 2:LIST
1000 READ b:IF b=-1 THEN RETURN
1010 POKE a,b:a=a+1:GOTO 1000
1020 REM
1030 REM channel 1 data
1040 DATA 152,0,3,&37,131,0,134,0,3,&37,136,0,1,&37,3,&40,1,&3b,1,&39,1,&3b
1050 DATA 2,&40,4,&37,3,&40,1,&3b,1,&39,1,&3b,2,&40,4,&37,3,&40,1,&3b,1,&39
1060 DATA 1,&3b,2,&40,3,&37,141,0,0,-1
1070 REM
1080 REM channel 2 data
1090 DATA 3,&34,3,&32,6,&30,3,&34,3,&32,6,&30,131,0,3,&35,6,&34,131,0,3,&35
1100 DATA 5,&34,129,0,3,&34,3,&32,6,&30,3,&34,3,&32,6,&30,3,&34,3,&32,3,&30
1110 DATA 130,0,1,&35,3,&34,3,&32,6,&30,0,-1
```

Demo program.

```
10 REM ** music test prog **
20 MEMORY &BFFF
30 a=&9000                          ' start of data
40 FOR octave=0 TO 5
50 FOR note=0 TO 11
60 PUKE a,1                         ' set duration
70 POKE a+1,16*octave+note          ' set octave & note number
80 a=a+2:NEXT note:octave
90 POKE a,0                         ' set end of data marker
100 |VOLUME,15
110 |MUSICON,15,&9000-2
```

Listing 3.

Listing 2.

```
10 REM machine code loader
20 check=0
30 FOR I=&A000 to &A2A0
40 READ J:check=check+J
50 NEXT
1000 DATA 0,0,0,0,0,0,0,0
1010 DATA 0,0,0,0,0,0,0,0
1020 DATA 0,0,0,0,0,0,0,0
1030 DATA 0,0,0,0,0,0,0,0
1040 DATA 0,0,0,0,0,0,0,205
1050 DATA 100,160,205,86,160,14,60,62
1060 DATA 7,205,52,189,33,6,160,6
1070 DATA 129,17,130,160,205,239,188,33
1080 DATA 0,160,17,30,0,237,75,29
1090 DATA 160,205,233,188,201,33,0,160
1100 DATA 205,10,189,205,236,188,22,3
1110 DATA 62,7,130,14,0,205,52,189
1120 DATA 21,32,245,201,42,22,160,34
1130 DATA 13,160,42,24,160,34,15,160
1140 DATA 42,26,160,34,17,160,62,1
1150 DATA 50,19,160,50,20,160,50,21
1160 DATA 160,201,33,19,160,1,22,160
1170 DATA 17,13,160,175,205,176,160,58
1180 DATA 28,160,254,1,200,62,1,35
1190 DATA 3,3,19,19,205,176,160,58
1200 DATA 28,160,254,2,200,62,2,35
1210 DATA 3,3,19,19,205,176,160,201
1220 DATA 53,192,229,197,213,245,34,37
1230 DATA 160,26,111,19,26,103,35,35
1240 DATA 124,18,27,125,18,126,254,0
1250 DATA 32,26,10,18,19,3,10,18
1260 DATA 62,1,42,37,160,119,241,245
1270 DATA 198,8,14,0,205,52,189,241
1280 DATA 209,193,225,201,203,127,40,9
1290 DATA 203,191,237,75,37,160,2,24
1300 DATA 229,237,75,37,160,2,35,229
1310 DATA 126,230,240,203,63,95,203,39
1320 DATA 131,95,22,0,33,53,161,25
1330 DATA 68,77,225,126,230,15,95,203
1340 DATA 35,96,105,25,241,245,203,39
1350 DATA 245,78,205,52,189,241,60,35
1360 DATA 78,205,52,189,241,245,33,31
1370 DATA 160,95,22,0,25,198,8,76
1380 DATA 205,52,189,24,170,119,7,12
1390 DATA 7,167,6,71,6,237,5,152
1400 DATA 5,71,5,252,4,212,4,112
1410 DATA 4,49,4,244,3,220,3,134
1420 DATA 3,89,3,36,3,246,2,204
1430 DATA 2,164,2,126,2,90,2,58
1440 DATA 2,24,2,250,1,222,1,195
1450 DATA 1,170,1,146,1,123,1,102
1460 DATA 1,82,1,63,1,45,1,28
1470 DATA 1,12,1,253,0,239,0,225
1480 DATA 0,213,0,201,0,190,0,179
1490 DATA 0,169,0,159,0,150,0,142
1500 DATA 0,134,0,127,0,119,0,113
1510 DATA 0,106,0,100,0,95,0,89
1520 DATA 0,84,0,80,0,75,0,71
1530 DATA 0,67,0,63,0,60,0,56
1540 DATA 0,53,0,50,0,47,0,45
1550 DATA 0,42,0,40,0,38,0,36
1560 DATA 0,34,0,32,0,1,211,161
1570 DATA 33,207,161,205,209,188,201,0
1580 DATA 0,0,0,228,161,195,7,162
1590 DATA 195,77,160,195,98,162,195,108
1600 DATA 162,195,113,162,77,85,83,73
1610 DATA 67,79,206,77,85,83,73,67
1620 DATA 79,70,198,80,65,85,83,197
1630 DATA 67,79,78,84,73,78,85,197
1640 DATA 86,79,76,85,77,197,0,245
1650 DATA 221,229,205,77,160,221,225,241
1660 DATA 254,2,216,254,5,208,254,2
1670 DATA 40,45,254,3,40,54,62,3
1680 DATA 50,28,160,221,110,0,221,102
1690 DATA 1,34,26,160,221,35,221,35
1700 DATA 221,110,0,221,102,1,34,24
1710 DATA 160,221,35,221,35,221,110,0
1720 DATA 221,102,1,34,22,160,221,35
1730 DATA 221,35,221,126,0,50,29,160
1740 DATA 205,39,160,201,62,2,50,28
1750 DATA 160,24,213,62,1,50,28,160
1760 DATA 24,219,205,86,160,33,6,160
1770 DATA 205,10,189,201,175,50,8,160
1780 DATA 201,254,0,200,254,4,208,254
1790 DATA 1,40,24,254,2,40,10,221
1800 DATA 126,0,50,33,160,221,35,221
1810 DATA 35,221,126,0,50,32,160,221
1820 DATA 35,221,35,221,126,0,50,31
1830 DATA 160,201,0,0,0,0,0,0
5000 IF check() 60526  THEN PRINT"
error in data"
```

Sound

Sound Master, for the 48K ZX Spectrum, allows you to store sound or speech into the computer's memory and replay it afterwards. But it also allows you to reverse the sound, replay it at eight different speeds, and with varying echoes.

The program itself is not very large, about 4K of Basic and 2.5K of machine code, but the enormous chunk of memory used to store the speech — almost 32K for four seconds — caters for 48K users only. I will give a detailed explanation of the use of the program later. First let me tell you how to get the program in you computer in the first place.

Enter program 1, make sure everything is keyed in exactly as in the listing. Save it using

SAVE "SM" LINE 1

and start the tape recorder. Press Enter. Enter program 2. When it runs perfectly Save the machine code using

SAVE "code 1" CODE 65025,224

and verify it. This is very important. Repeat the process with program 3 and Save the machine code with

SAVE "code 2" CODE 30000, 1835.

Start the tape recorder, press record and play together, and then press enter.

Now rewind the tape to the start of the code and press

VERIFY "" CODE

Clear the computer up

RANDOMIZE USR 0

You should get a black screen, red lines and the Sinclair copyright mesage, as if you just switched the computer on. Spectrum Plus owners can do this by simply pressing the little switch on the left-hand side of the machine.

Enter the Basic listing — program 4 — starting with

1 CLEAR 29999: LET spd=7

Never attempt to Run it or to press Go To (line number) since a crash will always be the result and you would have to start all over again.

Check everything carefully, then

SAVE "BASIC" LINE 1.

and verify.

Clear the computer as described then rewind the tape and enter Load "", no spaces. Sound Master should now load normally

The first thing you see when the program has loaded is the blue menu screen. You're presented with 10 options, numbered 0-9. They are:

1. Record sound

This option allows you to enter sound via a tape recorder or microphone which is attached to the Ear socket of the Spectrum. After about four seconds, an OK message should appear on your screen and the program then returns to the menu. However, if this does not happen then you have entered a wrong hex code between adresses 65025-65052.

What this routine does is scan the Ear socket at a rate of 64,512 Hertz or, 64,512 times per second, for a noise. If it recieves a noise, a click, it stores a 1 in its memory. If it doesn't, it stores a 0. These 1s and 0s are stored in memory in groups of eight, known as bytes. The analogue sound is digitised.

2. Replay sound

This option replays the sound you stored in the computer. It is, in fact, the reverse of option 1. It converts the 1s and 0s from memory to clicks and no-clicks.

This reproduces a sound which is quite recognisable. But because of the slow speed at which actions take place, and the Spectrum's limited speaker some ambiguity is unavoidable. Fantastic, clear sound is produced at a 17 mHertz rate, while ours is produced at 64 kHertz. This is due to the speed of the Z-80 microprocessor found in the Spectrum. It is, in fact, quite a fast eight-bit processor, but for our purposes not fast enough to produce a sound that is free from disturbing noise. Using a Dolby cassette deck would help in filtering out these noises though.

If we wanted a clear, solid sound for four seconds, then we would need a computer with 256 times more memory than the Spectrum, and which runs at least 256 times faster! Perhaps a Cray-1 will do. If you have any problems here, check your bytes between 65053 and 65085.

3. Change speed

The program allows you to replay the sound at eight different speeds. Speed 1 is superfast — you'll need mega-ears to understand any of it — and speed eight is the slowest. Speed 7 is the one at which sound is always recorded.

4. Disappearing Echo

It is impossible to do any magic with the Spectrum's sound speaker's volume under software control. So I present you with a disappearing echo instead of a fading one. Echo-steps may be controlled by the user. Echoing is done at the current speed, set at option 3. This is initially 7.

5. Appearing echo

Which is, of course, the opposite of option 4.

4. Fastening echo

This produces an echo which starts at the current speed and repeats, faster and faster, until it reaches speed 1. If, for example, the current speed is 5, then the speeds at which the program echoes are 5, 4, 3, 2, 1. If the current speed is 8, the speeds are 8,7,6, etc. This option has no effect whatsoever on the current speed at which sound is replayed in option 2.

7. Slowing echo

The echo starts at the current speed and slows down until it reaches speed 8. Again, this command has no effect on the current sound speed.

Listing 1.

```
  1 REM Sound Master VII/2.0
        By Roy Dictus 1985
 10 CLEAR 29999: CLS : LOAD ""C
ODE
 15 INPUT "Is your Spectrum Iss
ue 2? (A/N)";A$
 18 IF A$="Y" OR A$="y" THEN GO
TO 120
 20 POKE 65156,190
 30 POKE 65178,189
 40 POKE 65179,187
 50 POKE 65186,189
 60 POKE 65205,175
 70 POKE 65207,175
 80 POKE 65215,182
 90 POKE 65223,187
100 POKE 65231,189
110 POKE 65239,190
120 LOAD ""CODE
130 LOAD ""
```

Listing 2.

```
  1 CLEAR 65024
  2 DEF FN a($$)=CODE a$-48-7*(
a$>"9")-32*(a$>"Z"): DEF FN h($$
)=FN a(a$(1))*16+FN a(a$(2))
 10 RESTORE : LET a=65025: FOR
X=100 TO 120 STEP 10
 20 READ a$: LET t=VAL a$( TO 5
): LET a$=a$(6 TO ): IF LEN a$<2
<>INT (LEN a$/2) THEN PRINT AT 1
0,0;"Length error in line ";X: S
TOP
 40 POKE a,FN h(a$): LET t=t-PE
EK a: LET a=a+1
 50 LET a$=a$(3 TO ): IF a$<>""
THEN GO TO 40
 60 IF t THEN PRINT AT 15,0;"Er
ror in line ";X: STOP
 70 PRINT AT 15,0;"Line ";X;" O
K"
 80 NEXT X
100 DATA "09395f3210050050cbfe
1077200c0bfe6cb3e10f4cb0e237cfe6
20e8fbc97e7e00c8d7210f82100583e
d3fe3e15d37fe7cb0e10f0cb0e237cfe6
20e6fbc97e7e00c8d7210f82100583e
50771101580150"
 110 DATA "0816ed b0c9010003f2100
0011007e7e7f3a77112b1b0b78b120
f3210050110076e4e0605cb211f10fb23
1b7b3207f2093e08cd011601fef76e78
fefe200401e803c9fefd200401" "4c9
fefb200401b004c9"
 120 DATA "072177ef7200401405c9
fefe200401780f5c9010fefe78fefe20
0401d05c9fef7200401400fc9fefb20
0401a406c9fefd200401080fc9fefe20
0401b0c07c9010f401c9"
```

sampler

8. Load file

Use to Load a file previously saved using this program. You'll be asked for a filename but if you can't remember the name of the file you want to load, just press Enter. This command will only accept sound master-files.

9. Save file

When you have successfully sampled sound you may wish to Save it to tape. Enter the filename, start the tape recording and then press any key. Remember that 32,258 bytes have to be saved so saving might take as long as 2.5 minutes.

10. Reverse sound

The sound reverser reverses the sound stored in the micro. This means, effectively, that if you had a recording in your memory of you saying "computer" then the reversed version would say "retupmoc". Intonation is also reversed. This produces smashing effects.

Note that this option does not produce any sound, yet swops bits and bytes around in the computer's memory. This means that every other option, except 1, now operates on reversed sound.

If you now Save your file and load it back later, you will notice that the sound is still in its reversed form. To restore it to normal, just use option 0 again. Any troubles in reversing your sound? Check your bytes 65108-65150.

Trouble with the main menu screen has to do with wrong coding in locations 30000-300014. If you spot trouble, again check your hex codes.

For the technically-minded; speech is stored between adresses 32768 and 65024. Using the following routine, which I did not include in the main program, you can Invert the sound, that is, high sounds become low sounds and vice versa:

```
LD HL,32768     LD A,H
L1 LD A,(HL)    CP 254
CPL             JR NZ, L1
LD (HL), A      RET
INC HL
```

The program has been tested on Spectrum + and Spectrum issues 2 and 3. Program 1 includes the pokes necessary to adapt the program to run on Spectrum + and Spectrum issue 3.

If you would like a copy of Sound Master but find it rather tedious to key in the listings and machine code, simply send £2 to: Sound Master Offer, Roy Dictus, Apostelster. 8,2000 Antwerp, Belgium. You will recieve a copy of the program in your postbox.

Listing 3.

```
  1 CLEAR 29999
  2 DEF FN h(a$)=CODE a$-48-7*(
a$>"9")-32*(a$>"Z"): DEF FN h(a$
)=FN a$(1)*16+FN a$(2):
 10 RESTORE : LET a=30000: FOR
x=100 TO 320 STEP 10
 20 READ a$: LET tvAL a$( TO 5
): LET a$=a$(6 TO ): IF LEN a$/2
<>INT (LEN a$/2) THEN PRINT AT 1
6,0;"Length error in line ";x: S
TOP
 40 POKE a,FN h(a$): LET t=t+PE
EK a: LET a=a+1
 50 LET a$=a$(3 TO ): IF a$<>""
THEN GO TO 40
 60 IF t THEN PRINT AT 16,0;"Er
ror in line ";x: STOP
 70 PRINT AT 16,0;"Line ";x;" O
K"
 80 NEXT x
100 DATA "06078c33b7576fe00c8d7
2318f8af323c5c210058b3e4f771110158
015f000ed0d215475cd3375c916010113
0110101353af554e44204a4153544552
205244365205347554e44204a415354
45521603055b31fd
110 DATA "0490420524543af524420
534f554e44416005055b325b205245504c
415920534f554e44416070055b335d2043
4641464747420053504544416009055b34
5d2044495341505045415249464720453
43484f160b055b35"
120 DATA "0491254204150504541522
494647204543484f160d055b365d2046
415354454e494e47204543484f160f05
5b375d2005343af574946472045434484
161109553b3d204c6f414420464947c45
1613055b395d2053"
130 DATA "0533741564520464947c45
161505b305d205245564552534520533
f554e44400af323c5ccd45fe21c976cd
3375c9af323c5ccd45fe21797fcd3375
9af323c5ccd45fe21f377cd3375c9af
323c5ccd45fe217d"
140 DATA "10787cd3375c9af323c
5ccd45fe21e7bcd3375c9af323c5ccd
45fe215579cd3375c9af323c5ccd45fe
21b779cd3375c9af323c5ccd45fe215
f7cd3375c9af323c5ccd45fe21eb7acd
3375c9af323c5ccd"
150 DATA "0615745fe21537bcd3375
c91301160100101353af524420534f55
4e44202d2d204f5054494f4e20311604
0157652067265276f696e67207467
```

Listing 4

```
  1 CLEAR 29999: LET sp=0
  2 PAPER 5: BORDER 5: INK 0: B
RIGHT 1: CLS : RANDOMIZE USR 300
00: BEEP ,01,20
 500 LET a=USR 65151: GO TO a
1000 CLS : RANDOMIZE USR 30269
1001 GO SUB 9000
1002 RANDOMIZE USR 65025: PRINT
AT ,14,"OK": BEEP 1,30: CLS
 GO TO 10
1100 CLS : RANDOMIZE USR 30283
1101 PRINT AT 6,28;sp: GO SUB 9
000
1102 POKE 65058,sp: RANDOMIZE U
SR 65053: PAUSE 10: GO TO 10
1200 CLS : RANDOMIZE USR 30297:
PRINT AT 4,22;sp
1201 INPUT "speed ? [1-8]";+CH$;
b+0: IF sp>8 OR sp<1 THEN GO TO
1201: GO TO 1200
1202 PRINT AT 4,22;sp: BEEP 1,3
0: GO TO 10
1300 CLS : RANDOMIZE USR 30311:
GO SUB 9010: GO SUB 9000
```

```
20737467267652073675665642069e16
0601746665206367
 160 DATA "0674167075746572773
20646665642072796e20204d616b65608
0737572652074657652063616266573
206172652062667746820636f662d160a
0164656574646420746f204541522c20
7374617274207461"
 170 DATA "0587870652074686656e16
0017072657373206165e79206b657922e
00130116010452450442415920534f55
4e442022d2d204f5054494f4e20321604
015265706561617207367566564207374
6f7265642069642c"
 180 DATA "0601663616d70752d1606
0174657220e20254686520637572726
0746f207065616e20696e20616e6065
0150726573732066165e79206b657922
686566207265616a792e00130116010
4204a4153544552205244365205347
554e44"
 190 DATA "0590150454544202d2d20
4f5054494f4e20331604015468652063
7572726566742073706565642069732
202e1606015370656564732064757374
206265206966207468652072616e675
160501953202566"
 200 DATA "0544261737465737429
2d20338202873636f77657374295d2e16
0014e4f72696616c207370656564206
7320372e0130116010244495341505
4541524946472045434847202d204f50
544944202416040"
 210 DATA "0643701446973617070
6172696e67206563686f206174206375
7572726566742160173706565642077
696368209732020216010507265733
732016e79206b657920746f207374617
72742e0130116010"
 220 DATA "0590603415050454152
4647204543484f202d204f5054494f4e
20731604014170706617265206e672065
636667206174206375727265667416060
0173706656420776696368209732
202e16070173706656420"
 230 DATA "0604473732016e79206b
657920746f207374617274206e0130116
01044495341505045415249464720453
484f202d204f5054494f4e20361604016
4173746566696e67206563686f206174
206375727265667416060
173706656420"
 240 DATA "0540016060173706656
207766696368209732020216100150
```

```
1301 INPUT "Steps ? ";"";steps: LE
T x=INT (125/steps): FOR a=128 T
O 253 STEP x: POKE 65056,a: RAND
OMIZE USR 65053: NEXT a
1400 GO TO 10
1400 CLS : RANDOMIZE USR 30325:
GO SUB 9010: GO SUB 9000
1401 INPUT "Steps ? ";"";steps: LE
T x=INT (125/steps): FOR a=253 T
O 128 STEP -x: POKE 65056,a: RAN
DOMIZE USR 65053: NEXT a
1402 GO TO 10
1403 INPUT "Steps ? ";"";steps: LE
T x=INT (125/steps): FOR a=128 T
O 253 STEP x: POKE 65056,a: RAND
OMIZE USR 65053: NEXT a: POKE 65
056,128
1500 CLS : RANDOMIZE USR 30339:
GO SUB 9010: GO SUB 9000: FOR t=
sp TO 1 STEP -1: POKE 65058,t:
RANDOMIZE USR 65053: NEXT t: GO
TO 10
1600 CLS : RANDOMIZE USR 30353:
GO SUB 9010: GO SUB 9000: FOR t=
1 TO sp: POKE 65058,t: RANDOMIZ
E USR 65053: NEXT t: GO TO 10
```

```
72657373206166792065657920746f20
737461727420453011604454c4f57
494e472045434847202d2d204f505449
4f4e20371604015
 250 DATA "06282c6f77696e672065
636867206174206375727265667416060
017370656420776696368209732
202e16100150726573732066165e79206b
657920746f207374617274206010130116
01054c4f414420416"
 260 DATA "0595249c45202d2d2d20
4f5054494f4e20381604014c4f414420
66696e65202873675665642921160801
62656d6f6e73726f72204d6f77696c6c20
6f6e6c79204c4f414416040174656420
636f727265673420"
 270 DATA "0560534d20656e6c6573
2e160c014c6f6164696e672074696d65
206c69747a6c65206c6e65675216c
0174686165e6f6e73e352e0e0e0e0e7a65
702e0013011601055341564520464947
45202d2d204f50"
 280 DATA "0630544947416203916
01534156452066696c652e1600015468
652073675665642066696c652d72792077
696c6c206e6f772206265160a01756176
656420666f72206c617465720757365
2e320249742074"
 290 DATA "0571656b657316c01616
6d6f73742003324b3a207361766920
207469e6652061626f757416c0e01332e
352066696e757416c732e0013011601
52455545253452053475746420d2d2
2d204f5054494f4e"
 300 DATA "0667720301606015765
77696c6c207265766572736520746665
207367766e6416080173746f72656420
696e206d656e6f72792e2020416c6c20
736f756e64160a017769c6c206672
6d206e6f772066"
 310 DATA "0557120e6520706f6179
656420696e160c01726576657265652e
202054686973206616e206769766520
616d6179696e7180e016566666656374
732e20205420656520726f757469e6520
6973207365c662d"
 320 DATA "0539116100169e766572
74696e673a207468697320696973207
206279207765732c207468652073617
77696365c2c207468652073617566e620
77696c6c206265161401e6f726d616c
206167"
```

```
1700 CLS : RANDOMIZE USR 30367
1701 INPUT "Filename ? ";"";LINE
a$: IF LEN a$>10 THEN GO TO 1701
1702 LOAD a$CODE 32768,32256: GO
 TO 10
1800 CLS : RANDOMIZE USR 30381:
GO SUB 9000
1801 INPUT "Filename ? ";"";LINE
a$: IF a$="" OR LEN a$>10 THEN
GO TO 1801
1802 SAVE a$CODE 32768,32256
1803 INPUT "Verify ? (y/n) ";"";L
INE b$: IF b$(1)="y" OR b$(1)="Y
" THEN VERIFY a$CODE 32768,32256
1804 GO TO 10
1900 CLS : RANDOMIZE USR 30395:
RANDOMIZE USR 65108: PRINT AT 21
,0; PAPER 2; INK 7; BRIGHT 1; FL
ASH 1;"Any key ": GO SUB 9000: PR
INT AT 21,0;"Sound reversed.": B
EEP 1,30: BEEP 1,32: GO TO 10
8999 STOP
9000 IF INKEY$="" THEN GO TO 900
0
9001 RETURN
9010 PRINT AT 6,16;sp: RETURN
```

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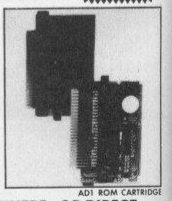

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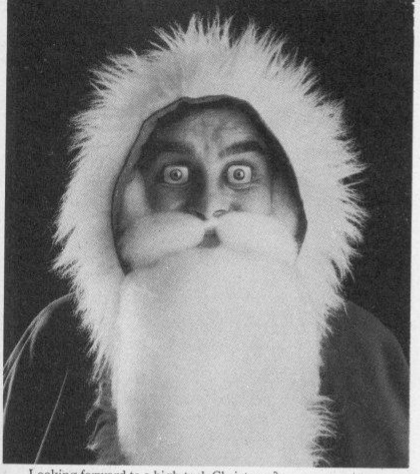

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COMPETITION

Transformers

COMPETITION RULES

- The winners of the competition will be the people who, in the view of the editor, come up with the most interesting or amusing ideas for what their computers might be transformed into.
- The names of the winners will be printed in the February issue of *Your Computer*.
- All entries must arrive at the *Your Computer* offices by the last working day in December 1985.
- Each person may enter the competition only once.
- Entries to the competition cannot be acknowledged.
- No employees of Business Press International or their relatives may enter the competition.
- The decision of the editor is final.
- No correspondence on the result of the competition will be entered into.
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16 Transformer Dinobots worth £20 each. We need to find homes for four Grimlocks, four Snails, four Sludges and four Slags. These Dinobots can be flipped from robots into prehistoric monsters to "defend Earth's primaeval outer fringes from the Evil Deception." We're also giving away 50 Spectrum and 50 CBM-64 copies of Ocean's new Transformer game.

All you have to do is send us drawings or written descriptions of what you think your computer might be transformed into.

TRANSFORMERS

Don't forget to enclose this coupon, or a photocopy of it, when you send in your entry to Transformers Competition, *Your Computer*, Room L221, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

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Rocketman

If you enjoyed Mad Caverns you'll go bananas over Rocket Man Mike — another commercial quality game from Karl Jeffery, the author of one of 1984's charttoppers, Mutant Monty.

Guide Mike around 10 screens collecting the amulets. Moving to the top of the screen takes you to the bottom of the next, so learning the geography of the place is easy.

To enter the game type in and save listings 1 and 2. On the other side of your tape save:

```
10 CLEAR 32667: LOAD ""
   CODE 32668: PRINT USR
   39202
```

Save it with:

```
SAVE "ROCKET" LINE 10
```

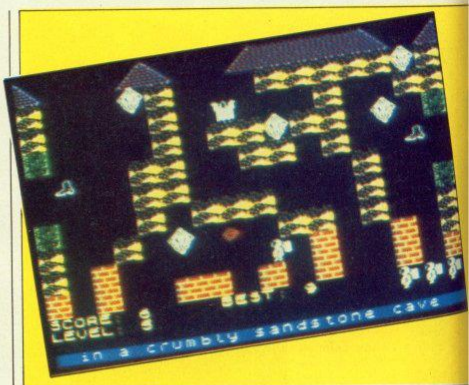
Now load and run listing 1. When it has finished Poking the machine code into memory, load and run listing 2, which Pokes the second part of the code. You can then save the blocks of code together, after the loader program, by typing:

```
SAVE "code" CODE 50000,
   8500
```

The controls for the game are as follows:

Z,C,B,M,Space	Right
Caps,X,V,N, Symbol Shift	Left
Q,W,E,R,T,Y,I,O,P	Thrust up
A,S,D,F,G,H,J,K,L	Hover/Stop
1	Pause
Caps and Space	Quit the game

A 15-screen version of the game, with extra music, is available for £3.50, while a full source code listing is available for £1.50. Write to Karl Jeffery, 27 Testcombe Road, Alverstoke, Gosport, Hampshire PO12 2EL.

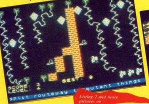


Listing 1.

```
  1 REM rocket data 1
  2 CLEAR 32499
  5 DEF FN a(a$)=CODE a$-48-7*(
a$>"9")-32*(a$>"Z"): DEF FN h(a$
)=FN a(a$(1))*16+FN a(a$(2))
 10 LET a=50000: FOR x=100 TO 5
90 STEP 10
 20 READ a$: LET t=VAL a$( TO 5
): LET a$=a$(6 TO ): IF LEN a$/2
<>INT (LEN a$/2) THEN PRINT AT 1
6,0;"Length error in line ";x: S
TOP
 40 POKE a,FN h(a$): LET t=t-PE
EK a: LET a=a+1
 50 LET a$=a$(3 TO ): IF a$<>""
 THEN GO TO 40
 60 IF t THEN PRINT AT 16,0;"Er
ror in line ";x: STOP
 70 PRINT AT 16,0;"Line ";x;" O
K"
 80 NEXT x
100 DATA "0173807070707070707
070707070707070707320303034540
4406054342470707070704040407070
7074343434342424242020642460505
050502024202070707070303030305
0506474747470707"
110 DATA "0199207070303030306
0607444444440707070707070000000
0000000000000000000000000000000
0000000000000000000000000000000
2f1e0c1f3b3b3b371e0c1c00000000
78f8f8787878000"
120 DATA "0393600000000001e2727
2f1e0c1f3b3b373f161a360000000078
78f8f8787878000000000000001e2727
2f1e0c1f3b3b333f1e3000000000078
78f8f8787878002820482400001e2727
2f1e0c1f3b3b333f"
130 DATA "062581e3000000000078
78f8f8787878010082450000000001e
1e1f1f1e1e1e0000000000000078e4e4
f47830f8dcdcdcec7830380000000001e
1e1f1f1e1e1e0000000000000078e4e4
f47830f8dcdcecfc"
140 DATA "0598468586c0000000001e
1e1f1f1e1e1e001404122400078e4e4
f47830f8dcdcccfc780c0000000001e
1e1f1f1e1e1e000810240a000078e4e4
f47830f8dcdcccfc780c0000000070
58c00818302030318"
150 DATA "031570c060300000000
00030e08e8b880c040c080000000000
0101c16121331a0a0e0c00000040e0a0
a020311312121a0a0e060000021e3018
0f010000000000000000000030000000
00e038704060301e"
160 DATA "0350033ee08003040c08
0818101c040603000000306000000
0000e0b0909c860c38e080000604040
03018000c04040612f380000000000
00808080c04040c0000000000301010
1010100000000"
170 DATA "0227900000000000000
008081c764341c000000000000000
000107040c080c060202030100000c
3fe30101000000000000000000000
80e03c07000000107 0c040600000000
00000080c07030e0"
180 DATA "0899200000000fefefe00
efefef00fefefe00efefef00fefefe00
efefef00fefefe00dfdfdf000000000
00000000030300e302de0b603020e0b
3036c0db00b600db00b600dbc0c07050
0cdc036d00db006d"
190 DATA "0754100db006d00000000
00000000c040300b00c6403b700db006d
00e0d006d00db006e00db006d00e00db
00b600b7007600db00b600b7a599a5c3
a599a5c3a599a5c3a599a5c3864a324a
864a324a864a324a"
200 DATA "08917864a324ae5d5f0c4
b1c4b5c6c5f0e4c091f5d0b415471b55
15eb47455b8b2f11435b075f00ffffff
bffdb7a94a54a24480258002 00fff7ff
bfed562d44954802880000a040006e110d
16021f20070d1101"
210 DATA "0870001010101000007844
80b8c4f0888889080808080814004108
8024c0eff0c29004a20983e812004801
0c7fffff7f0fa1087dfeff0fff1029c6
c62910ff844a31314a84ff00ff844a31
314a84ff21528c8c"
220 DATA "096625221ff00235da255
4955a2ddddda2554955a25d23c4ba45aa
92aa45bbbb45aa92aa45bac4c08f3f32
737b6c6e737b6c6e333f8fc003f1fcac
36bec6ee36bec6e63cfcf10303040a15
245b8bb3582b2d15"
230 DATA "08248150a04038040a050
68b4a29a34a8685050a040808a8adada
daaaaaaa8a8a8a8a8a8a8a97979494
a4a4a4c6c6a4a4a4949497970003828
3804040602070607030300000e0a0
e010101808fc4c1c"
240 DATA "02479f8180000000001c14
1c0404060207060703020000000000000
3828380808fc0cbcf808000000000e0a
0e0404040400f0c0f0706000000003828
3810101010f818f8f030000000000001
0303070700f0f0f0f"
250 DATA "0369507010000000000
8080c04060a0a060c080000000000000
00000107070f0f0f0603000000000000
0070f0f0a0a040c080000000000000001
0303070700f0f0f0f0701000000000000
8080c04060a0a060"
260 DATA "03295c000000000000000
000e0f0e0707030301000000000000
000080060b0d0f0e0c0000000000000
06130c2b1717 0b0c0300000000000080
b0e418ea7474e818e000000000000000
000516093130906"
270 DATA "0287301000000000000000
80d034c86664c830c000000000000000
00000516090b0906010000000000000
0000d034c868c830c000000000000000
000001060906010000000000000000
0000c0304830c000"
280 DATA "0244300000000001030301
00000102000030404020c0010b8b810
a044f840c030180808041800000060f06
00000102000030402060000001038389
0040f84040b0101808080100000060f06
00000300070500c00"
290 DATA "0391900000000060f06888
7040f84040b0103020204000000e0702
00000102000102020204000000e0702888
7044f84040b0103020204000000000
10180e090d0b090402000000000000000
08187090b0d090020"
300 DATA "0214440000000000000
10080e090d0b090404000000000000000
08107090b0d090202000000000000000
08080e0d0d0b090a100000000000000
101070b0b0d090500000000000000000
04080e0d0d0b090a"
310 DATA "036080a000000000000000
201070b0b0d090505000000000000208
0d2535161508a0b0407000000000002010
5050d07090d020c000000000000000001
0d253516140a0b0407000000000008
10d0d070c8689860"
320 DATA "0319280000000000000000
051535252b140d0a080700000000000090
20e488e818d030c080800000000000001
010515151716 0d0b0d070000000000000
2028684858f050a040800000000000307
0d2926170a121020"
330 DATA "0423920200000000000c0
```

Mike

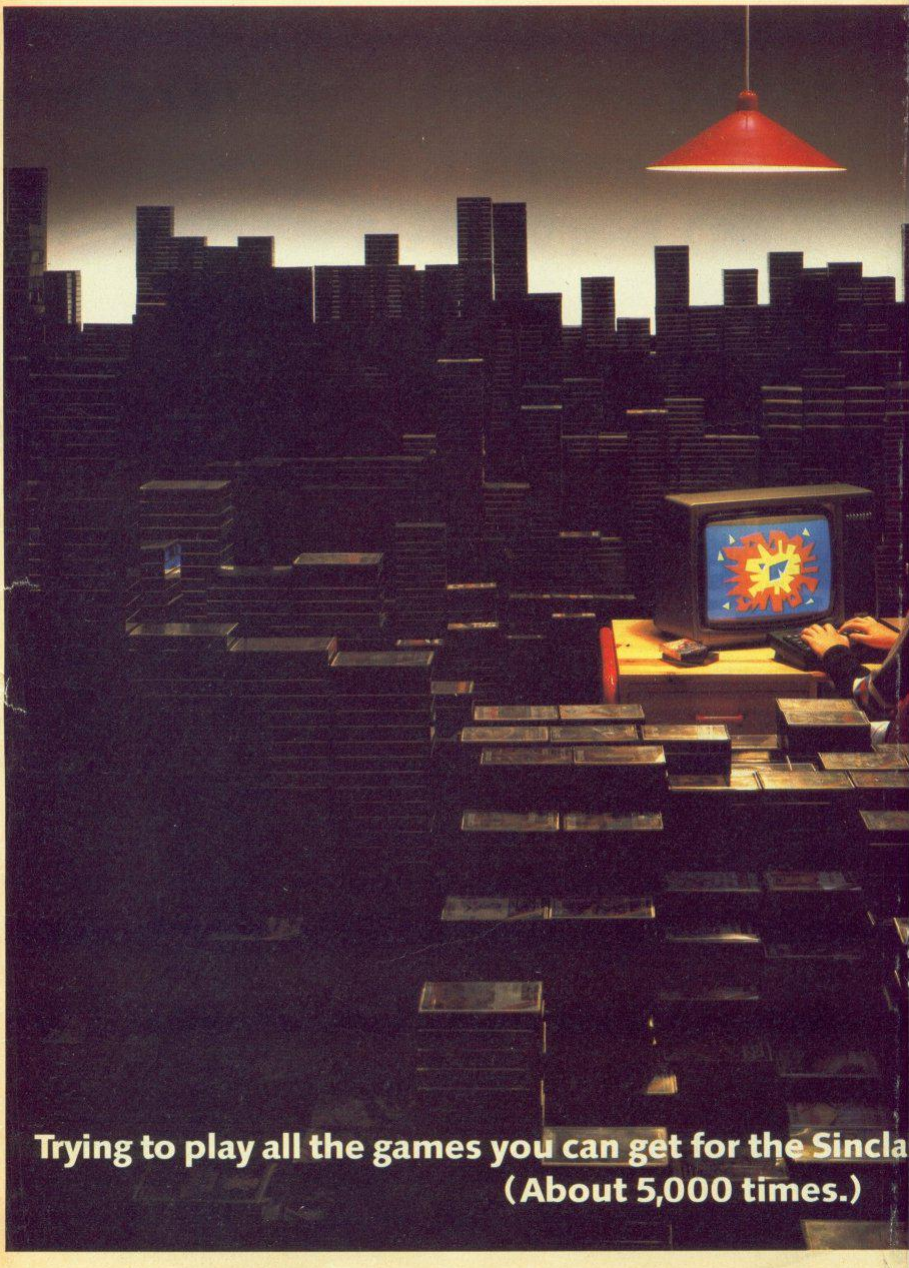
Karl Jeffery takes off on a Spectrum.

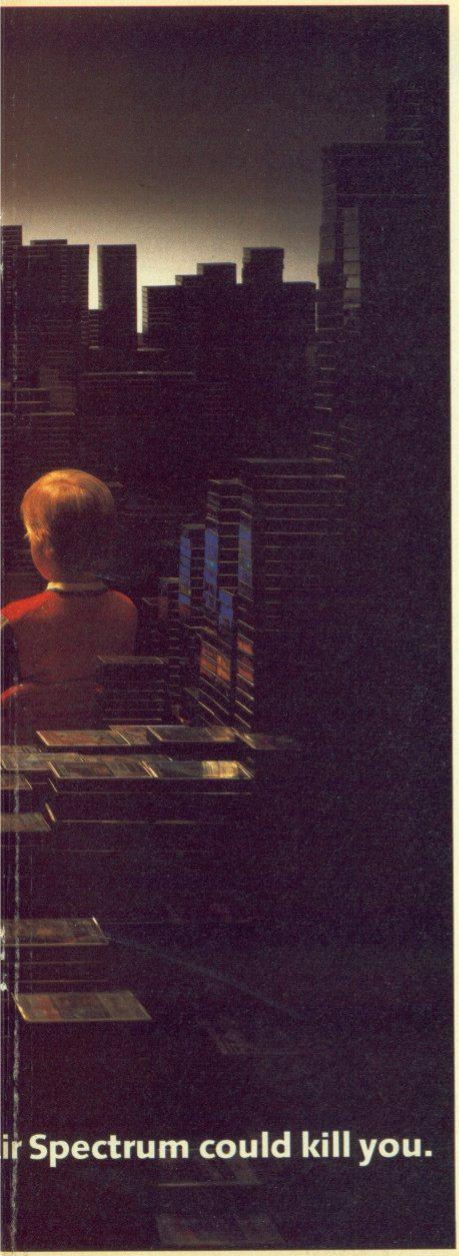


This program is available on the Telsoft service.

Listing 2 and more pictures on page 76

```
6028c8d0a09010008080000000000107
0d092617 0a12102010000000000000080c0
6020c8d0a090100810000000000000207
0d0906370a121020100000000000080c0
6020c0d8a09010e0"
 340 DATA "02729000000000000000307
0d292617 0a12100e0000000000000000c0
6028c8d0a0901008100000000000000003
0307050f0e060703030000000000000000
80c060e0c0c080800000000000000000000
03070d1f1e0e0f07"
 350 DATA "0570003000000000000000
80e070f8f8f0e0c000000000000000001
070f193f3e1e0f070000000000000000000
c0e020e0e0e0c08000000000000000030f
1f1f393f3e1e1f0f0707000000000080c0
f0f038f8f8f8f0e0"
 360 DATA "02218c080000000000000000
0101010101010638613f000000000000a0
50101010082814e43800000000000000101
0101010638613f00000000000000a05010
1010082814e43800000000000000000000
0101010101063861"
 370 DATA "038363f00000000000000a0
50101010082814e4380000000000000000
00000101010101638613f000000000000
00a0501010100082814e4380000071f1d
383819 0f0e1e37381e1f070000f0fcdc
8e8ecc78383cf68e"
 380 DATA "065263cfcf00000071f1f
383819 0f0e1e3f381e1f070000f0fcfc
8e8ecc78383cfe8e3cfcf0000030f1f
3c38190f0f0e1f181f0f030000e0f8fc
9e8ecc787838fc0c7cf8e00000071f1f
3838190f0e1e3f38"
 390 DATA "072851e1f070000f0fcfc
8e8ecc78383cfe8e3cfcf000000071d
367f00547f007f2b1e07000000000e0b8
ecfe0092fe00fe6cb8e0000000000071d
367f0054007f2b1e070000000000e0b8
ecfe009200fe6cb8"
 400 DATA "05913e000000000000071d
367f00547f007f2b1e070000000000e0b8
ecfe0092fe00fe6cb8e000000000071d
367f007f54007f2b1e070000000000e0b8
ecfe00fe9200fe6cb8e0000000000000
00300e013f3f3f1f"
 410 DATA "061211f0f0700007878 78
787818d858c0b87ceccc840000000000000
0000001f3f3f3f1f1f0f070000787878
787818d858c0b87ceccc840000000000000
00300e013f3f3f1f1f0f070000787878
787818d858c0b87c"
 420 DATA "06613eccc8400000000010
080402013f3f3f1f1f0f070000787878
787818d858c0b87ceccc840000030797a
3a3a3e3f1f1f1f1f1f1f1f1b000048e5e
5c5c7cfcf8f8f8f8f8f868000000717a
3a3a3e3f1f1f1f1f"
 430 DATA "078151f1f1b000008c5e
5c5c7cfcf8f8f8f8f8f868000000217a
7a7a3e3f3f3f1f1f1f1b120000000804c
5e5e7efcfcfcf8f8f868480000000112
3a7a3e3f3f3f1f1f1f1b12000000804c
5e5e7efcfcfcf8f8"
 440 DATA "04786f868480000000107
2d1a101d2f040603010000000000c0f0
daac845cfa903060c080000000000107
2d18121d2f040603010000000000c0f0
d88ea45ef8903060c080000000000107
2d1a101d2f040603"
 450 DATA "05125010000000000c0f0
daac845cfa903060c080000000000107
0d38123d0f040603010000000000c0f0
da8ca45cfa903060c0800000000000010
3938100000000000081c080000001c0880
c0000246e2e04000"
 460 DATA "0230000040e0000206024
0e0e04002002070010381000000080081c
08000400010383810028602000000071238
38100206227020040e24700000100440
644e0420002470702004 0c000044 0018
3c19000210393913"
 470 DATA "04842014861000040e440
4016020220048cc080301200000000030f
177f7d1f0708101000000000000000f2da
7cdc7cf8e010202000000000000000003
0f177f7d1f070810000000000000002f2
da7cdc7cf8e01020"
 480 DATA "039362000000000000000000
00030f177f7d1f070810100000000000
02f2da7cdc7cf8e010202000000000000
030f177f7d1f070810100000000000002
f2da7cdc7cf8e0102010000003c1818
180c0c0c0c0e0e06"
 490 DATA "048760607070000783030
3070706060e0e0c0c0c0c00000706060
70303030181818 1e0607070000381818
38303030606060e0c0c0c0000383030
3818181 80c0c0c0e0607070001c0c0c
1c181818303030f0"
 500 DATA "01761c0c0c0000078603 0
303038181800c0c0c0c0607000001e060c
0c0c1c181830303060e00000000000000
000000000000000000000000000000000
000000000000000000000000000000000
0000000000000000"
 510 DATA "0250300000000000000000
0000000000000000000000000202020 20
2020207468652073746172742063617 6
65726e2020202020202020200000111c
1c1c151a001a151c1c1c1c1c000f1100
000015000000001500"
 520 DATA "010891c1c630c0f0d1100
000000000000000001c1c000b0c631100
0000000000000000631c000c0b001100
0017171700000001c00000c0c000000
1214171717000000 1c1c000b0b000012
630000000 17171717"
 530 DATA "023931c1c000b0b001214
14141300000017171700000c0c000000
0000000000000000000000b0e090a0a
0a090a0909090a090a090a0d00000510
2f6002002ee02f600001529 08f3000ff
52309f3000ff3e30"
 540 DATA "036059f3000ff3e000000
000000000000000000000000000000000
0000000000000000000000020746865
206275696c64696e672073697465 2864
696e6b79206b6f6e67292020 17171717
001717171717 1700"
 550 DATA "009970017171700000000
00000000000000000000000000001a1a
1a15001a15000000121300000000000000
0015006315000012141413000000 1515
6315001515001214141414000001a1a1a
1a1a1a1a1a001100"
 560 DATA "01323000011000000000000
000000000000011006300110000 1a1a1a
1a1a631a1a1a110000001100000000000
0000000000000110000000000001a1a1a1a
1a1a1a1a000f0a090a0a090a000005d0
2f30000132102f70"
 570 DATA "042080100329 04f80ff00
32109f3000ff32509f500100320000 00
000000000000000000000000000000000
000000000000000000000002074686 5
2063617665726e206f66206 16c69656e
207065617264726f"
 580 DATA "011037073202000191900
191919191900001919000012191900000
000000160000000000000001419630000
00000016000000000000001214111111 00
001a1a160 01b1b000012141400001111
0000001600000000"
 590 DATA "00952000000000000006311
0000001600001b00160000000000001111
0000001600001b000016630000111100
001a1a16000000000000001600111 10000
00000016630 01b000000001611171717
0017171617171b00"
```


Trying to play all the games you can get for the Sincla
(About 5,000 times.)



How would you like to be blasted out of the sky by anti-aircraft guns?

Or perhaps you'd prefer to be vapourised by a Thargoid starship.

Or eaten for breakfast by mutant rats.

Well, you have all this and more to look forward to, if you get a Sinclair Spectrum +.

Because there are more games available for the Spectrum + than any other home computer.

(About 5,000 the last time we counted.)

Not all of which lead to such sticky ends, we might add.

You may, for instance, rather battle it out on the chess board with a Russian grand master. Or cross swords with Nick Faldo on the golf course.

You won't just have the pick of the current titles either.

You'll get first shot at the new ones too. Because most of them become available for the Spectrum + before anything else.

And because there are so many other Spectrum owners there are more books and magazines and clubs to join.

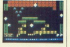
So if you get a Spectrum +, you may well end up in a Grand Prix pile-up.

And your chances of being killed by Gremlins are very high.

But you'll never die of boredom.

sinclair

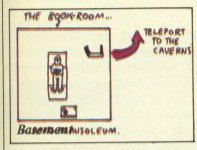
Rocketman Mike



Listing 2.

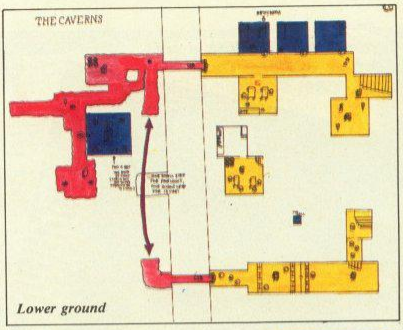
```
   1 REM rocket 2
   2 DEF FN a(a$)=CODE a$-48-7*(a$>"9")-32*(a$>"Z"): DEF FN h(a$)=FN a(a$(1))*16+FN a(a$(2))
  10 LET a=54001: FOR x=100 TO 660 STEP 10
  20 READ a$: LET t=VAL a$( TO 5): LET a$=a$(6 TO ): IF LEN a$/2<>INT (LEN a$/2) THEN PRINT AT 16,0;"Length error in line ";x: STOP
  40 POKE a,FN h(a$): LET t=t-PEEK a: LET a=a+1
  50 LET a$=a$(3 TO ): IF a$<>"" THEN GO TO 40
  60 IF t THEN PRINT AT 16,0;"Error in line ";x: STOP
  70 PRINT AT 16,0;"Line ";x;" OK"
  80 NEXT x: PRINT AT 16,0;"All OK": REM Now save the code with SAVE "CODE" CODE 50000,8500"
 100 DATA "04324171716000005409f7000ff22f06f60ff0022807f4000ff22902f3e00013a807f4000ff220000000000000000000000000000000000000000000000000000000000073706c697420726f7574657761"
 110 DATA "02765792074 6f206d7574616e74207468696e677320100018000018100018001800001800180c000c00630f0d00116306000000c630b0b000b000f0d006311000b000000b000c0b000b000b000000011000e1063"
 120 DATA "005100b000c0c630c000b0000001100000c000c000b0b000b0000000001100000c000b000b0b000c00000000111100000b000c000c0b000b0000001100110000c0000000b0c000000000110011000000b00"
 130 DATA "02661000000b0e0918001811000011000000e1000000e00000590 6f5000ff3e906f5000ff3e906f5000ff3e502f5000013e502f5000013e0000000000000000000000000000000000000000000000000000000"
 140 DATA "034200000000202 0696e20612063727 56d626c792073616e6473746f6e652063617665202020130000001213000012141414141300121900000063190000001919191919631919000000001900000000001900"
 150 DATA "01010001919160000000019001919631919006300160000000019190000191900190000000000000019190000000000001900000016000000190019191900000019000016190000190063000000191900 19"
 160 DATA "025050000191900110000000000000110000110019110011000011110011001100001100110000005107f3000ff3e603f1001003ae07f4000ff3e608f4001004e608f4001004e00000000000000000000000000"
 170 DATA "036380000000000000000000000000000000000000000000206162616e646f6e20686f706520706173742074686973206c6576656c202020001c1c1c1e1c1c1c1c1c1c1c1c1c1c001616 1c1c1c1c1c1c1c1c631c1c1c1c"
 180 DATA "005271c00161600000000000000000000001c001600000000000000000000000000000000000000000000000636300000000171717170000000000000000000000000017170000171717 0000"
 190 DATA "021430000001600000000190063000000190000001616000000190000000000190000001616000000191900001919191919190016000000510 8f9001003618 7f9001003620 6f9001003 6287f9001003630 0f"
 200 DATA "041719001003600000000000000000000000000000000000000000000000000020616e20756e64657267726f756e6420746f696c65742066616374 6f7279202062626262626212141413626262"
 210 DATA "015636200626262621214141414141414141413620062121414141414141400001414141400131100000000000000000000000000000000111 11a1a001a1a1a1a1a1a1a1a1a1a1a1a11110000000000000000000000000"
 220 DATA "018030063111111a1a1a151a1a00001a1a1a1a1a1a1a1a1111000000150000000000000000000000000011116315000000150000000000000000000000110e0a150a090a1509090e0a0090a10000f000005d02f50ff004a803f4001"
 230 DATA "03881004a105f6002004a207fb801004a207fb801004a000000000000000000000000000000000000000000000000000000000000000000002020636176 65726e206f66206861756e74696e67207370697269747320"
 240 DATA "01006202020000000000150 01c1c1c1c00001c1c1c001b1b000015000000631500000631c1b00001b1b1a001a1a1a1a1a001a1a1c000000001b0000000000000000000000000000000000000001b0000000000000000"
 250 DATA "01243000001b000001b1a1a1a1a0000 1a1a1a1a1c1b000000 1b00000016000016000001c1b0000631b001600160000160016001c1b00001b1b631600000000000000 1600 1c001b1b001c1c1c1c1c1c1c1c1c1c"
 260 DATA "031551c001c0000005507f8801004e506f8001004e208f6000ff4e702f5001004e702f5001004e00000000000000000000000000000000000000000000000000000000000000000002020202074686520696e766973"
 270 DATA "0500669626c65206d656761206d617a6520202020206262626262626262626262620062626262620000000000626262626200620000000000062000063000062636200620063620000062000006262626262620000 6262000062626200"
 280 DATA "03531000000000000000000000006262630062626262626200626200620062006200000000000006262000000620000000620063620000062626262620000626262620062006200626262630000000000062000000000000"
 290 DATA "0276700006262626262626200062626262000062626200000055 04f2001005 6504f2001005 6504f200100565 04f200100565 04f20010056000000000000000000000000000000000000000000000000000"
 300 DATA "034960000002020746865206261636b2070726f636573736 96e67207 06c616e74202020200000000012141414141300006200620000000012141414141414141362006200000001200000015000000000001413"
 310 DATA "012331111111000014001500150015000014141d0011000011001500630015000001a1a1a0011111111100001a1a1a151a001563150011111000000000000063150000000001500111100 1a1a1a1a1a1a001a1a1a00"
 320 DATA "026110000011110000000000000000000015000011 1a1a1a1a1a1a1a1a1a1a001a1a1a1a000005102f9001005a604f50ff005aa08f4000ff5a008f2001015a008f2001015a00000000000000000000000000"
 330 DATA "027300000000000000000000000000000000000000007a02340 0a1023100 7a023400a1023100 7a0234005 80327 00f7022b0026032900c4034500 6a061400110519 00c40322005803 4e0011051900ff03200058"
 340 DATA "033350327002603530 07a023400a1023100 7a023400a1023100 7a023400580327 00f7022b0026032900c4034500 6a0614001105190 0c40322005 8034e00110519 00260329005803270 0c4034500 7a023400a1"
 350 DATA "034570231007a023400a10231007a023400580327 00f7022b002603290 0c4034500 6a061400110519 00c4032200 58034e0011051900ff03200058032700260353007a023400a10231007a023400a10231007a"
 360 DATA "03066023400580327 00f7022b002603290 0c4034500 6a061400110519 00c4032200 58034e0011051900260329005803270 0c403450058032700260329002603290 0cb022e007a0268003e041e00540237007a"
 370 DATA "0361002340 0cb025d00c7041b007a023400cb022e00260353 0011051900cb022e00260329005803 4e0011051900ff0320005803270058032700 7a0234007a023400a10231007a023400a10231007a023400cb"
 380 DATA "03651022e007a023400cb022e007a023400a10231007a023400cb022e007a023400cb022e007a023400a10231007a023400580327 00f7022b002603290 0c4034500 6a061400110519 00c4032200 58034e0011"
 390 DATA "03485051900ff03200058032700260353007a023400a10231007a023400a10231007a023400580327 00f7022b002603290 0c4034500 6a061400110519 00c4032200 58034e00c7041b00580327002603530 07a"
 400 DATA "033700234 00a10231007a023400a1023100cb022e0058032700f7022b002603290 0c4034500 6a061400110519 00c4032200 58034e0011051900260329005803270 0c40345005803270026032900cb022e007a"
 410 DATA "04681026800 3e041e00540237007a023400cb025d00c7041b007a023400cb022e00260353 00110519 00cb022e002603290 058039d000000cd45a0068 70e983e1dcd6d9f066f0e683e06cd6d9f06770e903e1d"
 420 DATA "05286cd6d9fcd8c9f1301100711021600e0020454e5445522054 4f20504c4159205 24f434b455420 4d414e204d494b452e201300110016150010 04636f707972696 76874203139383 52c206279206b61726c20"
 430 DATA "099056a65666665 72792e1007ffdd218009 6dd6e00dd23dd6600dd23dd5e00dd23dd5600dd237cb528e4dde5cdb503dde101febfed78cb47200adb1fcb6f20d2cb6728ceed4b69a03a61a0b820043a60a0b930"
 440 DATA "06994 04ed4360a0af3265a0328d5c3269a0326aa03268a03e053267a03e00326ea0326da021a08c060f3e63c506a0be2002361d2310f0016000009c110ee21a08c1600060f3e1dc506a0be2001142310f90160"
 450 DATA "0029300009c110ef7a3266a0cd45a03a67a0060f0eeff53e01cd6d9f79d6184ff13d20f23e01cd0116cd8c9f160100110110 07ffaf326ca03270a0326fa03c3264a03e043263a0ed4b6da0ed4371a03a68a067"
 460 DATA "079042e001100 8c190620 7ed72310fb225d9d22f59d2a5d9d06af0e007eb72807e5c5cd6d9fc1e12379c6104f20ee78d61047fe0f20e623232306 0a110000dd2176a07e23dd77037e23dd77047e23dd77027e"
 470 DATA "0717223dd77007e23dd77017e23dd7705afdd77063cdd77 07dd1910d63e02cd0116cd8c9f10061301161400 53434f52453a0d4c4556454c3a1614 07ffed4b69a0cd1b1acd8c9f161507ff3a68a03c06004fcd"
 480 DATA "096441b1acd8c9f16140d424553543a20ffed4b60a0cd1b1adb1f5fe6e020021e0001fefded785701febfed78a2f6e03c2802cbe301fefeed78e61f67f60a5701fe7fed78e61f6ff615a2cb4b2004fe1f2811"
 490 DATA "075053a6fa03d3dfefc2808326fa03e013264a07cf615677df60aa4cb432004fe1f28113a6fa03c3cfe042808326fa03e053264a0afcb6328143a5fa03d282b3e01325fa03263a03d326fa0181d325fa001fe"
 500 DATA "09486fbed785701fedfed78a2e61fee1f3eff2004cb5b28023e013270a0ed4b6da00047cd499d78d60f47cd499d79c60f4fcd499d78c60f47cd499d78feaf200f3a68a03c3268a03e27326ea0c3369afe1f20"
 510 DATA "094070f3a68a03d3268a03ea7326ea0c3369a326ea03a63a0b72005 3e043263a0fe042006 3a70a03262a03a6fa0573a6da0824f3a6ea047cde19d79c60f4fcde19d78d60f47cde19d79d60f4fcde19d79fef1"
 520 DATA "0909838 0afefa3ef03001afcd39a0326da0ed4b6da03a63a0b73a64a05f280a3a6ca0e60183c60210 0a79cb3fcb3fcb3fe60183cd6d9fdd2176a03e063273a0dd6601dd6e007cb528577ddd8603dd77034f7c"
 530 DATA "09051dd8604dd770447dd3406dd7e02ddbe0620107ced44dd77017ded44dd7700afdd77063a6ca0dd8605cd6d9f3a6da0d60dddbe033019c61addbe0338123a6ea0d60dddbe043008c61addbe04d2999e1100"
 540 DATA "09262 00dd193a73a03dc2979c3a6ba03c326ba0e618cb3fcb3fcb3f326ca001fef7ed78cb4720132 1c000116400cdb503af32085c3a085cb728fa01fefeed785f01fe7fed78b3cb47ca2299c3339b26005469"
 550 DATA "10381cb3dcb3dcb3dcb3d3eaf90e6f05f1911 0000197eb7c8fe63c8fe1dcc989dd13a65a0573a66a0baca159e3a63a0b7ca359c3d3263a0ca359ccd39a03a62a0cb7f3a63a0c2d89bed44c3d89b3e63773a65"
 560 DATA "08226a03c3265a0c578f60f4779e6f04fafcd6d9fed4b69a00303 03ed4369a0cd8c9f161407ffcd1b1a21ed03110800cdb50321d007110a00cdb5032114051114 00cdb503c1c926005469cb3dcb3dcb3dcb3d"
 570 DATA "074933eaf90e6f05f19110000197eb7c8fe63c8fe1dcc989dd13a65a0573a66a0ba2807af326fa0c36c9ccd45a0cd8c9f100511001301160800100620 20524f434b455420 4d414e204d494b452048 41532045"
 580 DATA "04866534341504 5442c200d0d20205741544348204f55542046 4f52204f544845522047414d455320425 90d0d0d0d1005202020206b2061207220 6c2020206a20652066206620652072207920792020202020ffaf"
 590 DATA "0855232085c3a085cb728fac322992 60 8c5215046110400cdb503ed4b6da03e57cd6d9f21401f110500cdb503ed4b6da03e59cd6d9fc110d8ed4b71a0ed436da03a67a03d3267a0c2369acd45a0cd8c9f1004"
 600 DATA "04032110016150053434f52453a161507ffed4b69a0cd1b1acd8c9f11021007160800202020202020202020202020202020202020202020202020202020202020202020202020202020202020206720612 06d20652020"
 610 DATA "05171202 06f2076206520722020202020202020202020202020202020202020202020202020202020202020202020202020ff21d00706ff10fe2b7cb520f7c32299 26006fe5119c7f197ee129292929292911"
 620 DATA "0964300080195fcd989f79c6084fcd989fc9e17efeff2004d72318f723e9c5d5c5cd11a078d60847cd11a078d60747cd11a079c6074fcd11a078c60747cd11a078c60847cd11a0c13e103238a0561e00c5e53e"
 630 DATA "09969af9047a71f371fa71fa8e6f8a867790707 07a8e6c7a807076f79e60747afb80eff200ccb3fcbffcb19cb3acb1b10f4a6b2772379a6b377e1c123053a38a03d20b6d1c1c9c5e5d5cb38cb38cb383e1590"
 640 DATA "0629526006f2929292929cb39cb39cb3916005919110058 19d173e1c1c900f53e00ed4b6da0cd6d9ff1c921000400100 1b360023 0b78b120f83e02cd0116af32485cd3fec900000000000000000000000000000000000"
 650 DATA "0366200000000000000000000000009640554 4f54414c04444546420130000096505 4c4956455304444546420130000096604534352 4e04444546420130000096705534 34f52450444454657013000009680441434e54"
 660 DATA "006560444454642013000096905 41464c000000000000"
```

Hot Shots

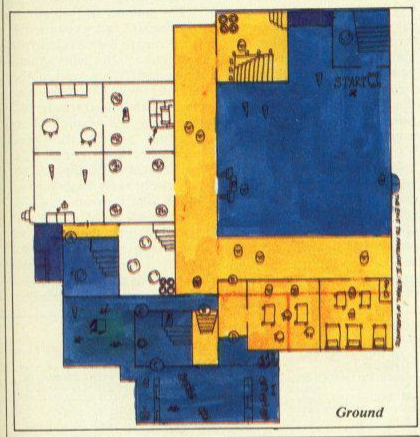


MAP OF FAIRLIGHT

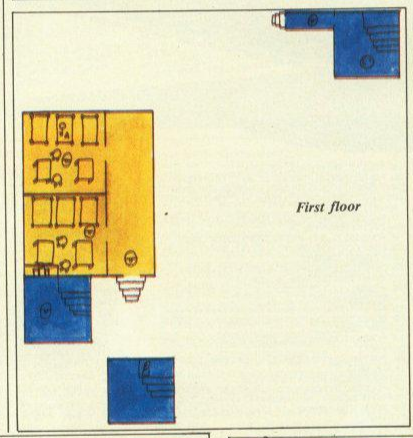
by Mischa Welsh and Stephen Hill



Lower ground

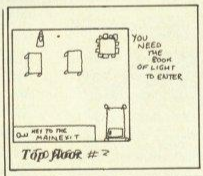


Ground

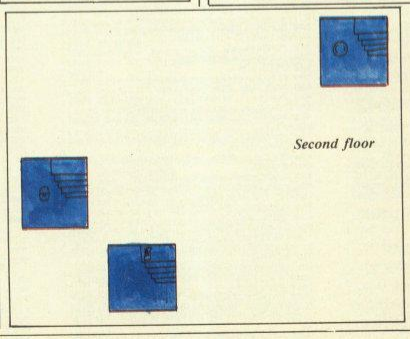


First floor

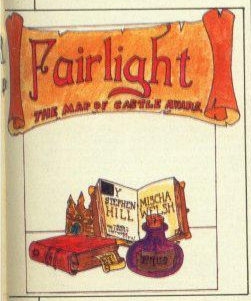
It's the dead of night — no one can hear you scream. No one, that is, except David Williams. Call him on 041-770 9599 after 9pm for help with your adventure problems.

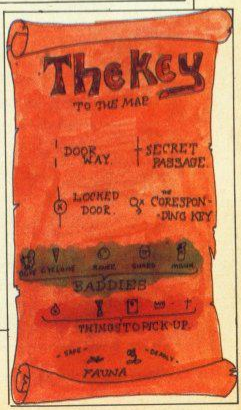


Top floor #2

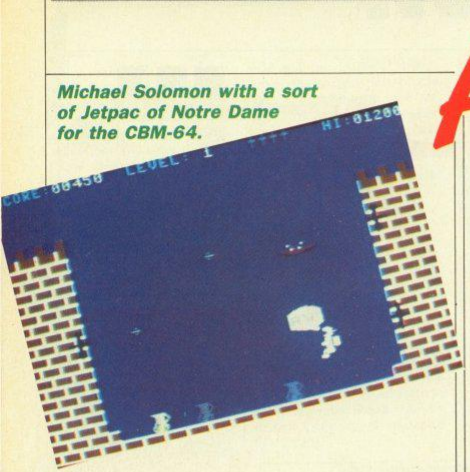


Second floor





Charlie



Michael Solomon with a sort of Jetpac of Notre Dame for the CBM-64.

After a nasty incident with a black hole Charlie Chambers, the NASA astronaut, has been transported back into medieval times.

His only way back to the present is to collect diamonds from the jugs at the bottom of the courtyard. Archers fire arrows across the castle to stop him. These marksmen can only be killed by a direct hit in their arrow slits. An olde worlde bat flies around the courtyard — he cannot be killed but a hit is worth 300 points.

Charlie must avoid the arrows and the bat to reach the jugs and then to return to the diamonds to the top of either castle wall. After clearing each screen the game gets progressivly more difficult until level 6 when the gravity factor comes into play — if Charlie doesn't move he'll be pulled downwards.

The game is written as a series of machine-code routines accessed by a control routine which in turn is accessed by one Sys call in Basic. The machine code will only return to Basic for one of six reasons.

The reason is stored in location 957 and when control is returned to Basic the program will go to the appropriate subroutine. When finished, the routines will return to the machine-code control program. The name and location of all routines are in the Rem statements among the data statement at 11000 onwards, so they can be easily disassembled.

The first program must be typed in and saved to tape, the second program should then be saved directly after the first. Listing 1 contains the Sprite data and the data for the VDGs. Listing 3 contains the game and

Listing 2.

```
10 POKE52,48:POKE56,48:CLR
20 POKE53280,0:POKE53281,0:PRINT"(CLR)(D
OWN)(DOWN)(DOWN)(DOWN)(DOWN)(DOWN)
(DOWN)(DOWN)(DOWN)";TAB(14);"(WHT)PLEASE
 WAIT";V=53248
25 S=54272:FORI=0TO23:POKES+I,0:NEXT:POK
E5+24,15:POKEV+21,0
30 POKE53272,29:GOSUB11000:GOSUB13000
32 FORI=1TO6:READSP(I),A1(I),A2(I),A3(I)
:NEXT:HS$="00000"
35 DIMF(13):FORI=0TO13:READF(I):NEXT
37 DIMHI(50),LO(50),DU(50):I=1
38 READHI(I),LO(I),DU(I):I=I+1:IFHI(I-1) -
<>999THENGOTO38
40 REM*********************************
42 POKE53272,21:POKEV+17,PEEK(V+17)AND19
1:GOTO 2000
45 POKE833,0:POKE834,255:I=PEEK(V+30)+PE
EK(V+31)
50 FORI=0TO4:POKE835+I,1:POKE840+I,104+(
I*32):NEXT
55 POKE800,0:POKE49152+11,0
57 POKE801,0:POKE802,64:POKE807,0:FORI=0
TO49:POKE880+I,INT(RND(0)*16):NEXT
60 SC=0:SC$="00000":LE=1:L=5:LI$=";;;;;
";DI=0
70 POKE53272,20:GOSUB 8000
80 REM*********************************
90 POKE 946,A1(LE):POKE947,A1(LE)
100 POKE948,A2(LE):POKE949,A2(LE)
110 POKE950,A3(LE):POKE951,A3(LE)
115 POKE952,SP(LE):POKE953,SP(LE):POKE95
4,2:POKE955,2
120 POKE957,0:I=PEEK(V+30)+PEEK(V+31):PO
KE834,255
130 SYS49892
140 ONPEEK(957)GOTO100,150,300,200,500,4
00
149 REM*********************************
150 POKE2047,234
155 SYS50013:I=13:POKEV+21,PEEK(V+21)AND22
3:JUG=PEEK(834)-1:IFJUG=-1THENJUG=4
160 POKE840+JUG,0:PRINT"(HOME)(DOWN)(DOW
N)(DOWN)(DOWN)(DOWN)(DOWN)(DOWN)(DOWN)(D
OWN)(DOWN)(DOWN)(DOWN)(DOWN)(DOWN)(DOWN)
(DOWN)(DOWN)(DOWN)(DOWN)(DOWN)(DOWN)(DOW
N)";TAB(10+JUG*4);" "
170 PRINTTAB(10+JUG*4);" (HOME)";POKE83
4,255:POKEV+21,PEEK(V+21)OR128
175 SC=SC+150:GOSUB800:GOTO120
179 REM*********************************
180 FL=0:IFPEEK(V+21)>128THENFL=1
181 POKEV+14,(PEEK(V)-14)ANDZ55:POKEV+15
,PEEK(V+1)-21:POKE2047,235
182 IF(PEEK(V+46)AND15)=1THENPOKEV+46,3
183 POKEV+21,PEEK(V+21)OR128
184 POKES+4,0:POKES,48:POKES+1,4:POKES+5
,90:POKES+6,172:POKES+2,0:POKES+3,200
186 POKES+4,65:FORI=0TO1080:NEXT:POKES+4,
64
187 FORI=0TO1000:NEXT:POKEV+21,PEEK(V+21
)AND127
188 LI=LI-1:LI$=LEFT$(LI$,LI)+" ":PRINT"
(HOME)(C=5)";TAB(24);LI$:IFLI=0THEN1000
190 POKEV+21,PEEK(V+21)AND252
192 POKEV,45:POKEV+1,61:POKEV+16,PEEK(V+
16)AND254:POKE2040,226
195 POKEV+21,PEEK(V+21)ORI
197 FORI=0TO1000:NEXT
198 IFFL=0THEN120
199 SC=SC-150:GOSUB800:GOTO205
200 IFPEEK(V+21)<128THEN120
202 SC=SC+150:GOSUB800
205 POKEV+21,PEEK(V+21)AND127:POKEV+21,P
EEK(V+21)OR32:SYS50013:DI=DI+1
210 IFDI<5THEN120
220 DI=0:FORI=0TO4:POKE840+I,104+(32*I):
NEXT:FORI=0TO2:POKEV+41+I,0:NEXT
230 PRINT"(HOME)(DOWN)(DOWN)(DOWN)(DOWN)
(DOWN)(DOWN)(DOWN)(DOWN)(DOWN)(DOWN)(DOW
N)(DOWN)(DOWN)(DOWN)(DOWN)(DOWN)(DOWN)(D
OWN)(DOWN)(DOWN)(DOWN)(DOWN)";TAB(18);"(
YEL)++  (C=5)++  (C=6)++  (C=7)++      (PUR)
++"
240 PRINT TAB(18);"(YEL),-   (C=5),-   (C=
6),-   (C=7),-   (PUR),-(HOME)"
245 LE=LE+1:IFLE>6THENLE=1:POKE49152+11,
1
250 PRINT"(HOME)(YEL)";TAB(19);LE:GOTO 9
0
300 SL=INT((PEEK(958)AND28)/8):IF(PEEK(V
+41+SL)AND15)=2THEN120
310 POKEV+41+SL,2
330 SC=SC+250:GOSUB800
340 GOTO 120
399 REM*********************************
400 POKEV+21,PEEK(V+21)AND253
410 POKES+11,0:POKES+11,17:FORI=35TO45ST
EP2:POKES+8,I:POKES+7,135:POKES+12,24
415 POKES+13,250:FORJ=0TO10:NEXT:NEXTJ:PO
KES+11,16
420 POKEV+21,PEEK(V+21)AND191:POKEV+12,1
66:POKEV+13,153
430 POKEV+21,PEEK(V+21)OR64:POKE880,INT(
RND(0)*50)
440 SC=SC+300:GOSUB800:GOTO120
500 FORI=PEEK(V+15)TO224:POKEV+15,I:NEXT
:SC=SC-150:GOSUB800
510 POKE834,255:GOTO 205
520 GOTO 120
600 I#=MID$(STR$(SC),2):SC#=LEFT$("00000
",5-LEN(I#))+I#:PRINT"(HOME)(RIGHT)(RIGH
T)(RIGHT)(RIGHT)(RIGHT)(RIGHT)(YEL)";SC#
610 RETURN
999 REM*********************************
1000 POKEV+21,0:POKE53280,0:POKE53281,0
1010 FORI=0TO4
1020 PRINT"(CLR)(DOWN)(DOWN)(DOWN)(DOWN)
(DOWN)(DOWN)(DOWN)(DOWN)(DOWN)(DOWN)(DOW
N)(DOWN)(WHT)";TAB(11);"G A M E   O V E
R"
1030 FORJ=0TO400:NEXT:PRINT"(CLR)";FORJ=
0TO400:NEXT
1040 NEXT I
1050 IFSC$>HS$THENHS$=SC$
1060 GOTO 42
1999 REM*********************************
2000 SYS50013:13:PRINT"(CLR)(DOWN)";TAB(
6);"(YEL)(C=D)(C=I)(C=I)(C=I)(C=I)(C=I)(
C=I)(C=I)(C=I)(C=I)(C=I)(C=I)(C=I)(C=I)(
C=I)(C=I)(C=I)(C=I)(C=I)(C=I)(C=I)(C=I)(
C=I)(C=I)(C=I)(C=I)(C=I)(C=F)"
2005 PRINTTAB(6);"(YEL)(RVS)(C=K)(OFF)
                    (C=K)"
2010 PRINTTAB(6);"(YEL)(RVS)(C=K)(OFF)
(BLU)C H A R L I E   A N D   (YEL)(C=K)"
2020 PRINTTAB(6);"(RVS)(C=K)(OFF)
                    (C=K)"
2030 PRINTTAB(6);"(RVS)(C=K)(OFF)      (B
LU)T H E   J U G S   (YEL)(C=K)"
2040 PRINTTAB(6);"(RVS)(C=K)(OFF)
                    (C=K)"
2050 PRINTTAB(6);"(C=C)(RVS)(C=I)(C=I)(C
=I)(C=I)(C=I)(C=I)(C=I)(C=I)(C=I)(C=I)(C
=I)(C=I)(C=I)(C=I)(C=I)(C=I)(C=I)(C=I)(C
=I)(C=I)(C=I)(C=I)(C=I)(C=I)(C=I)(C=I)(C
FF)(C=V)"
2052 PRINT"(DOWN)(DOWN)(DOWN)(DOWN)(DOWN
)(DOWN)(DOWN)(DOWN)(DOWN)(DOWN)(DOWN)(DO
WN)(DOWN)(DOWN)(DOWN)(DOWN)(RED) WRITTEN
 BY MICHAEL SOLOMON   (CYN)(C) 1985(HOM
E)"
2055 POKEV,40:POKEV+1,134:POKE2040,226:P
OKEV+39,1
2057 POKEV+2,52:POKEV+3,134:POKE2041,225
:POKEV+40,1:POKEV+16,2
2060 FORI=2TO6:POKEV+1+(I*2),134:POKEV+I
*2,112+(32*(I-2)):POKEV+39+I,1
2070 POKE2040+I,230:NEXT:POKEV+28,0:POKE
V+21,127:GOSUB9000
2080 PRINT"(DOWN)(DOWN)(DOWN)(DOWN)(DOWN
)(DOWN)(DOWN)(DOWN)(DOWN)(DOWN)(DOWN)(DO
WN)(DOWN)(DOWN)(DOWN)(DOWN)";
2090 PRINT TAB(6);"(C=I)PRESS (WHT)FIRE(
C=I) TO START THE GAME"
2110 IF(PEEK(56320)AND16)=16THEN2110
2120 PRINT"(CLR)";POKEV+21,0:GOTO45
6999 REM*********************************
8000 POKEV+17,PEEK(V+17)OR64:POKEV+34,1
8002 PRINT"(BLK)(CLR)";:FORI=0TO24:POKE1
063+I*40,37:NEXT:POKE53281,6
8005 PRINT"(HOME)(CYN)SCORE:(YEL)";SC$;"
  (CYN)LEVEL:(YEL)";LE;"  (C=5)";LI$;"
(CYN)HI:(YEL)";HS$
8007 FORI=1TO4:PRINT"(BLU)&";NEXT
8008 C$="(C=1)":IFPEEK(49152+11)=1THENC$
="(C=5)"
8010 PRINTC$" % % %";TAB(33);"% % % "C$
8015 PRINT"(SH )(SH )(SH )(SH )(SH )
(SH )";TAB(33);"(SH )(SH )(SH )(SH )(SH
)(SH )(SH )"
8020 YY$="(C=T)(C=8)":ZZ$="(C=8)(C=T)"
8025 FORI=1TO8
8030 PRINTYY$;YY$;"(BLU)&(C=8)
```

and the jugs

the machine-code routines. I can supply copies on tape for £2.99 to Sollysoft, 203 Shelly Road, Wellingborough, Northants, NN8 3EN.

Listing 1.

```
10 POKE52,48:POKE56,48:CLR
20 POKE53280,0:POKE53281,0:PRINT"(CLR)(D
OWN)(DOWN)(DOWN)(DOWN)(DOWN)(DOWN)(DOWN)
(DOWN)(DOWN)(DOWN)";TAB(14);"(WHT)PLEASE
 WAIT":V=53248
30 S=54272:FORI=0TO23:POKES+I,0:NEXT:POK
ES+24,15:POKEV+21,0
40 GOSUB 10000:GOSUB12000
50 POKE631,147:POKE632,131:POKE198,2:END
60 REM*********************************
10000 IFPEEK(12288)=60THEN10025
10010 POKE56334,PEEK(56334)AND254:POKE1,
PEEK(1)AND251
10015 FORI=0TO2047:POKE12288+I,PEEK(5324
8+I):NEXT
10020 POKE1,PEEK(1)OR4:POKE56334,PEEK(56
334)OR1
10025 FORI=0TO111:READA:IFI<=103THENPOKE
12560+I,A:GOTO10028
10026 POKE(59*8+12288)+(I-104),A
10028 NEXT
10030 RETURN
10040 DATA 0,127,127,127,127,127,127,0
10050 DATA 0,254,254,254,254,254,254,0
10060 DATA 255,255,255,255,255,255,255,2
55
10070 DATA 192,192,192,192,192,192,192,1
92
10080 DATA 3,3,3,3,3,3,3,3
10090 DATA 127,127,127,127,127,127,127,0
10100 DATA 254,254,254,254,254,254,254,0
10110 DATA 0,0,255,63,31,31,31,31
10120 DATA 0,0,224,240,216,204,204,216
10130 DATA 63,55,119,239,223,239,127,63
10140 DATA 240,192,224,240,176,176,96,19
2
10150 DATA 0,0,48,64,254,64,48,0
10160 DATA 0,0,12,2,127,2,12,0
10170 DATA 24,24,126,126,24,24,24,24
10999 REM*********************************
12000 FORI=0TO10:FORJ=0TO62:READA:POKE((
225+I)*64)+J,A:NEXT:NEXT:RETURN
12005 REM         CHARLIE 1
12010 DATA 0,240,0,0,252,0,0,60,0,0,28,0
,0,60,0,0,240,0,0,0,0,0,240,0,0,235,192
12020 DATA 0,107,192,7,235,192,7,235,192
,0,11,192,0,251,192,0,0,0,3,240,0,7,240
12025 DATA 0,7,240,0,7,0,0,31,0,0,31,0,0
12027 REM         CHARLIE 2
12030 DATA 0,31,0,0,63,0,0,60,0,0,56,0,0
,60,0,0,31,0,0,0,0,0,31,0,3,215,0
12040 DATA 3,214,0,3,215,224,3,215,224,3
,208,0,3,223,0,0,0,0,0,31,192,0,31,224
12050 DATA 0,31,224,0,0,224,0,0,240,0,0,
240
12055 REM         WINDOW SLITS
12060 DATA 0,0,0,0,20,0,0,62,0,0,20,0,0,
20,0,0,20,0,0,20,0,0,20,0,0,20,0
12070 DATA 7,255,240,7,255,240,0,20,0,0,
20,0,0,20,0,0,20,0,0,20,0,0,20,0
12080 DATA 0,20,0,0,62,0,0,20,0,0,0,0
12085 REM         BULLETS
12090 DATA 0,0,0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,0,0
12100 DATA 240,0,0,240,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
12110 DATA 0,0,0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
12120 DATA 0,0,31,0,0,31,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
12130 REM         JUGS
12140 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
,255,224,0,63,240,0,31,216,0,31,204,0
12150 DATA 31,204,0,31,216,0,63,240,0,55
,192,0,119,224,0,239,240,0,223,176,0
12160 DATA 239,176,0,127,96,0,63,192,0,0
,0,0,0,0,0
12165 REM         BAT 3
12170 DATA ..............................
.......3,0,192,0,85,0,0,85,0,0,215,0
12180 DATA 2,85,128,10,85,160,42,150,168
,160,0,42,128,0,2
12185 REM         BAT 2
12190 DATA ..............................
.......3,0,192,0,85,0,0,85,0,160
12200 DATA 215,42,170,85,170,10,85,160,2
,150,128,.....
12205 REM         BAT 1
12210 DATA ..............................
.......3,0,192,128,85,2,160,85
12220 DATA 42,42,215,168,10,85,160,2,85,
128,0,150,0,.....
12225 REM         DIAMOND
12230 DATA 0,0,0,0,42,0,0,166,128,2,154,
160,0,166,128,0,42,0,0,0,0
12240 DATA ..............................
............0
12245 REM         BUBBLE
12246 DATA 0,0,0,0,0,0,0,0,0,0,0,255,0,15,
255,240,63,255,252,255,255,255,251,251
12250 DATA 187,234,251,187,238,251,187,2
38,251,187,234,250,191,238,251,191,238
12260 DATA 251,187,238,251,187,255,255,2
55,255,255,252,15,255,240,0,255,192,0,3
12270 DATA 240,0,0,240
```

```
                         ":"(BLU)'";C$;ZZ$;ZZ$
;ZZ$
8040 PRINTZZ$;ZZ$;ZZ$;"(BLU)&(C=B)
                         ":"(BLU)'";C$;YY$;YY$
;YY$
8050 NEXT
8060 PRINT YY$;YY$;YY$;"(C=T)";TAB(32);"
(C=T)";ZZ$;ZZ$;ZZ$
8070 PRINT"(C=8)(C=T)(C=8)(C=T)(C=8)(C=T
)(C=8)(C=T)(C=8)(C=T)(C=8)(C=T)(C=8)(C=T
)(C=8)(C=T)(C=8)(C=T)(C=8)(C=T)(C=8)(C=T
)(C=8)(C=T)(C=8)(C=T)(C=8)(C=T)(C=8)(C=T
)(C=8)(C=T)(C=8)(C=T)(C=8)(C=T)(C=8)(C=T
)(C=8)(WHT)(HOME)";
8071 PRINT"(DOWN)(DOWN)(DOWN)(DOWN)(DOWN
)(DOWN)(DOWN)(DOWN)(DOWN)(DOWN)(DOWN)(DO
WN)(DOWN)(DOWN)(DOWN)(DOWN)(DOWN)(DOWN)(
DOWN)(DOWN)(DOWN)(DOWN)";TAB(10);"(YEL)*
+  (C=5)*+   (C=6)*+   (C=7)*+   (PUR)*+"
8072 PRINT TAB(10);"(YEL),-  (C=5),-  (C
=6),-  (C=7),-  (PUR),-(HOME)"
8075 POKEV,45:POKEV+1,61:POKEV+39,1:POKE
2040,226:POKEV+40,0:POKE2041,228
8080 POKEV+4,26:POKEV+5,117:POKEV+41,0:P
OKE2042,227
8085 POKEV+6,26:POKEV+7,109:POKEV+42,0:P
OKE2043,227
8090 POKEV+8,54:POKEV+9,157:POKEV+16,12:
POKEV+43,0:POKE2044,227
8095 POKEV+11,223:POKEV+44,6:POKE2045,23
0:POKEV+27,34
8097 POKEV+28,192:POKEV+12,166:POKEV+13,
153:POKEV+45,8:POKEV+37,4:POKEV+38,1
8098 POKE 2046,231
8099 POKEV+46,3:POKE2047,234
8110 POKEV+21,125:SYS 50013
8120 RETURN
8999 REM*********************************
9000 REM      PLAY TITLE TUNE
9005 I=1:POKES+2,0:POKES+3,0
9010 IFLO(I)=999THENPOKES+4,64:RETURN
9020 POKES+5,24:POKES+6,250:POKES+4,0:PO
KES+4,65
9030 POKES,LO(I):POKES+1,HI(I)
9040 FORJ=0TODU(I)*55:NEXT
9050 I=I+1:GOTO9010
10999 REM*********************************
11000 A=49152
11010 READA$:IFA$="***"THEN:RETURN
11020 FORJ=1TOLEN(A$)STEP2
11030 Y$=MID$(A$,J,1):Z$=MID$(A$,J+1,1)
11040 Y=ASC(Y$)-48:IFY>9THENY=Y-7
11050 Z=ASC(Z$)-48:IFZ>9THENZ=Z-7
11060 POKEA,Y*16+Z:A=A+1:NEXT:GOTO11010
11062 REM -- MOVE MAN/LOOK UP(49152) --
11065 DATA 00000000FFFFFF00010101
11067 DATA 00FF010000FF010000FF01
11070 DATA AD00DC290F490FAAF000A9E1E007
11080 DATA 9002A9E2800F007AD000D0187D00C0
11090 DATA 8D000DAD01D0187D00C0C93890038
D0100
11100 DATA AE00D0AD10D02901D000E000D000
11110 DATA A9010D10D00D10D060E0FFD000
11120 DATA A9FE2D10D000D10D060
11125 REM ----- BULLET (49255) -----
11130 DATA AD15D02902D053AD000C2910F001
11140 DATA 60AE00D00E02D0AE01D0E0D000F20
E03D0
11150 DATA AD10D02901F000AD10D00902
11160 DATA 8D10D018900AD10D029FD8D10D0
11170 DATA AD15D009028D15D0ADF007186903
11180 DATA 8DF907C9E5F006A9FF8D400360
11190 DATA A9010D400360
11200 DATA AE02D0000AD10D049028D10D00A
11210 DATA 186D40038D02D0AD1FD02902F000
11220 DATA AD15D029FD8D15D060
11230 REM -- JUG INTERRUPTS (49382) --
11240 DATA EAEAEAEAEAEAEAEAEAEAEAEAEA
11245 DATA EAEAEAEAEAEAEAEAEA
11250 DATA AE4103AD1ED02920F0060E4203
11260 DATA 4C31EA8D4303F00680400380DAD0
11270 DATA E8E0050002A2008E41034C31EA
11280 REM ---- LEFT ARROWS (49444) ----
11290 DATA A200A007C8B1FBC92ED001E888
11300 DATA 91FBC8C01FD0F0A92091FB60
11310 REM --- RIGHT ARROWS (49469) ----
11320 DATA A200A01F88B1FBC92FD001E8C8
11330 DATA 91FD88C007D0F0A92091FB60
11340 REM --- ARROWS CONTROL (49494) --
11350 DATA A96085FBA90585FC2024C18E4D03
11360 DATA A93085FBA90685FC203DC18E4E03
11370 DATA A9D085FBA90685FC2024C18E4F03
11380 DATA 60
11385 REM ---- BAT CONTROL (49537) ----
11390 DATA AE77038DAA031A69E70DFE07209EC
1AE77
11400 DATA 03E8E0008D002A2008E770360
11405 REM ----- MOVE BAT (49566) -----
11407 DATA AE70038D7003AA
11410 DATA AD00D0187D6003A8AD0CD010
11420 DATA 7D5003C053901FC0C9801BC951
11430 DATA 9017C9FFB0138D0CD00C0D00
11440 DATA AC7103C8CC7203F0040C710360A00
0
11450 DATA 8C7103AE7003E0E032D002A200
11460 DATA 8E700360
11465 REM -- MOVE EVERYTHING (49642) --
11470 DATA 2016C02067C02067C0CE8803D009
11480 DATA ADBA038D8D032001C1
11490 DATA AD29D0290FD013CEB303D00EAD02
11500 DATA 038D0303A92E8D07052O5EC2
11510 DATA AD2BD0290FD013CEB503D00EAD04
11520 DATA 038D0503A92F8D037062O5EC2
11530 DATA AD2AD0290FD013CEB703D00EAD06
11540 DATA 038D0703A92E8DCF06205EC2
11550 DATA CEB903D009AE880038E890320560C1
11560 DATA 60
11570 REM ---- ARROW SOUND (49758) ----
11580 DATA A9000D04D4A9580D05D4A90F8D06
11590 DATA D4A9490D00D4A9140D01D4A9810D
11600 DATA 04D460
11605 REM ---     CHECKS (49789)     ---
11607 DATA AD1ED08DBE03
11610 DATA AD15D02900D00CAE4203E8F006
11620 DATA A9028D8D0360AD1FD02901D007
11630 DATA AD8E032901F006A9010D8D0360
11640 DATA AD8E03291CF006A9038D8D0360
11650 DATA AD000DC925D006A9048D8D0360
11660 DATA AD8E032900F006A9058D8D0360
11670 DATA AD8E032940F006A9068D8D0360
11680 DATA A9008D8D0360
11685 REM --- MAIN PROGRAM (49892) ---
11690 DATA 20EAC1AD00D08D0ED0AD10D02901
11700 DATA F008AD10D009008D10D0189000
11710 DATA AD10D0297F8D10D0EE2ED0AD01D0
11715 DATA 1869168D0FD0207DC2
11720 DATA A200A0FF8D0FDCAD0FBAD8003
11730 DATA F08FC901F005C904F02060AE00D0A
C01D0
11732 DATA E0549014E0FD010C0CD900CC0DF
11733 DATA 8000A9008D8D034CE4C2
11734 DATA 60AD15D02980D008
11735 DATA A9008D8D034CE4C260
11737 REM --- TURN ON INTS  (50013) ---
11740 DATA 78A9E68D1403A9C08D15035860
11745 REM --- TURN OFF INTS (50026) ---
11750 DATA 78A9318D1403A9EA8D15035860
11990 DATA ***
11999 REM*********************************
12999 REM    LOOK UP TABLES FOR BAT
13000 FORI=0TO31:READA:POKE840+I,(A AND2
55):NEXT
13010 FORI=0TO 7:READA:POKE938+I,A:NEXT
13020 DATA 0,1,2,2,2,2,2,1,0,-1,-2,-2,-2
,-2,-2,-1
13030 DATA -2,-2,-2,-1,0,1,2,2,2,2,2,1,0
,-1,-2,-1
13040 DATA 0,0,1,1,2,2,1,1
13050 RETURN
13099 REM*********************************
13100 REM   ARROW SPEEDS AND DELAYS
13110 DATA 6,190,150,170
13120 DATA 6,150,100,120
13130 DATA 4,100,70,50
13140 DATA 4,100,70,50
13150 DATA 2,100,90,120
13160 DATA 2,50,90,60
13165 REM*********************************
13170 REM      MUSIC NOTE VALUES
13180 DATA 451,506,268,301,337,358,401,4
77,0,284,318,0,379,425
13199 REM*********************************
13200 DATA 18,209,3,19,239,3,21,31,3,33,
135,5,21,31,3,33,135,5,21,31,3,33,135,8
13210 DATA37,162,3,39,223,3,42,62,3,33,1
35,3,37,162,3,42,62,5,31,165,3,37,162,5
13220 DATA33,135,8,33,135,2,37,162,2,42,
62,2,33,135,2,37,162,2,42,62,4,33,135,2
13230 DATA37,162,2,33,135,2,42,62,2,33,1
35,2,37,162,2,42,62,4,33,135,2,37,162,2
13240 DATA33,135,2,42,62,2,33,135,2,37,1
62,2,42,62,4,31,165,2,37,162,4,33,135,6
13900 DATA 999,999,999
```

Telsoft

The programs given here will enable Spectrum, BBC, and CBM-64 owners to download via *Your Computer's* Telsoft service. Each month for each machine we transmit least one — and usually two — of the main programs appearing in the current issue. Also available is the full user to user communications program Dialsoft.

So far OE LTD's Telemod 2 and the VTX 5000 modems have been tested with the BBC and Spectrum but the service also works with a number of other makes. For the CBM-64 it will initially only be available with the OEL Comms pack together with the Telemod 2 or similar modem; later we hope to adapt the service to work with Commodore's modem.

Hexloader

To enter the download program first type in the hexloader for your machine — figure 1 — and then enter the machine code — figure 2. Once the program has been saved you can run it by entering CALL &6000 on the BBC, SYS 51000 on the CBM 64, RANDOMIZE USR 60000 on the Spectrum.

To find out what is available and how to receive software dial up Colchester (0206) 8068. This audio recorded information line will also advise you which telephone numbers to ring for the 300 and 1200 bits/ services.

When a program you want to

Figure 1. CBM-64.

```
5 REM   HEX LOADER FOR CBM 64     FIG.1
6 REM
10 FOR I=680 TO 727:READ:POKE I,A:T=T+A
20 NEXT:IF T=6716 THEN GOTO 100
30 PRINT"ERROR IN DATA ";T-6716:END
40 DATA 169,1,133,186,169,1,133,184
50 DATA 133,185,169,0,133,183,169,208
60 DATA 133,187,169,2,133,188,169,56
70 DATA 133,251,169,199,133,252,169,251
80 DATA 162,231,160,206,32,216,255,96
90 DATA 65,79,87,73,76,79,65,68
100 SA=51000 LA=52855
110 INPUT"START ADDRESS";A
120 IF (ASC(A) OR (A<0)) THEN GOTO 140
130 IF A/8=INT(A/8) THEN GOTO 150
140 PRINT:PRINT"ADDRESS ERROR":GOTO 110
150 T=(A-32768)AND255:PRINTA,:INPUTB
160 IF B="END" THEN GOTO 900
170 IF LEN(B)>20 THEN GOTO 190
180 PRINT"WRONG LENGTH" GOTO 150
190 FOR B=0 TO 7:B#=MID$(B#,2*B+1,2)
200 BX=VAL(B#,30):IF E=1 THEN GOTO 280
210 POKE A+B,D:T=T+D:NEXT
220 B#=MID$(B#,18,3):GOSUB 300
230 IF E=1 THEN GOTO 280
240 IF T=D THEN GOTO 260
250 PRINT"CHECKSUM ERROR" GOTO 150
260 A=A+8:IF ACLA THEN GOTO 150
270 GOTO 900
280 PRINT TAB(8+2*B+D);"??"
290 B#="":NEXT:GOTO 150
300 E=0:D=0:FOR N=1 TO LEN(B#)
310 C#=MID$(B#,N,1):GOSUB 400
320 IF E=1 THEN D=D+N*4:NEXT:RETURN
330 D=D+(C#<>"0"):NEXT:RETURN
400 X=ASC(C#)-48:IF X>10 THEN E=1:RETURN
410 IF X<10 THEN RETURN
420 X=X-7:IF X<10 THEN E=1:RETURN
430 IF X>15 THEN E=1
440 RETURN
500 H#="0123456789ABCDEF"
510 FOR B=SA TO LA STEP 8
520 PRINT A,"??";T=A-32768:AND255
530 FOR B=0 TO 7:X=PEEK(A+B):GOSUB 600
540 T=T+X:NEXT:PRINT" ";
560 V=INT(T/256):PRINT MID$(H#,V+1,1);
570 X=255 AND T:GOSUB 600:PRINT
580 NEXT:GOTO 900
600 PRINT MID$(H#,INT(X/16)+1,1);
610 PRINT MID$(H#,X-(X*16)+1,1);:RETURN
800 SYS 680:D#=H#:GOSUB 300
810 PRINT PRINT"10 DATA COD CODE ";
815 PRINT PRINT"  LOAD"C#"DOWNLOAD".
820 PRINTC#",1,1 (RETURN)"
825 PRINT PRINT"  THEN TYPE   NEW".
830 PRINT"  (RETURN)"
835 PRINT PRINT"TO RUN THE PROGRAM".
840 PRINT"  SYS 51000  (RETURN)"
900 PRINT PRINT PRINT"1  ENTER DATA"
910 PRINT PRINT"2  PRINT DATA"
920 PRINT PRINT"3  SAVE DATA"
930 INPUT Z:ON Z GOTO 100,500,800
```

Figure 2. CBM-64.

```
51000 ? A9068D210080D200A9E2
51008 ? A90FBD860280A920E24
51016 ? D2FFA9008D15D0A9-4D
51024 ? F8D8A02BA6E92CE-510
51032 ? 20CHC920C7D820F8-4D5
51040 ? CAHD80CEC931F023-532
51048 ? C935F014C936D006-43F
51056 ? 208EC74C5BC7F914-410
51064 ? 20D2FFA9FFD0D8-52E
51072 ? 203FC8A92020D2FF-461
51080 ? 4C93C94C4AC8203-411
51088 ? CC0220CDA95B85F-D41
51096 ? A9CE85FE20C8CDA9-547
51104 ? 002095CC202FCBC9-404
51112 ? 44F00BC954D0ED20-4E1
51120 ? D2FFA901D007A944-4EF
51128 ? 20D2FFA9003580A20-4B9
51136 ? 25CDA9020A0BCCA9-483
51144 ? BD85FDA9CD85FE8-6A0
51152 ? 002095CC2025CD20-383
51160 ? 95CC9648A0048CB3-4CC
51168 ? CE20D8C968A0205-4C4
51176 ? CD2095CC9848A906-4C5
51184 ? D83CE20D8C9ADA7-5E3
51192 ? CE85FBA9CDE85FC-6E8
51200 ? 68A8206C8C8A9185-3B8
51208 ? B985B998A293A0CE-539
51216 ? 20BDFFAE9CECAA-56F
51224 ? CEE0D001C8205CD-479
51232 ? 20FB20D8FF20F1C8-797
51240 ? 6020D9CC90D00B-3FE
51248 ? A900857A92020D2-3E0
51256 ? FFA9D20D2FFC0A9-4E7
51264 ? 0D20A9C9A9C0D20-3A6
51272 ? FF602063CCA000A9-43F
51280 ? FF9993CEC8D0FA20-5FB
51288 ? D2CB90FE20D2CB90-5ED
51296 ? FB8D72C9A900B7C-4A0
51304 ? CE8C7DCE202ECCA0-4D4
51312 ? 72CE29F0C980D0E4-5C6
51320 ? 20D2CB80A9973C8-599
51328 ? C202ECCC009D0F0-4EB
51336 ? A000D7C9C9D0D0-4A2
51344 ? 0FA52B85F18A52C-3D8
51352 ? 6D75CE85FC4CAAC8-587
51360 ? AD78CE85FBAD79CE-607
51368 ? 95FC20D2CB80A20-5EB
51376 ? D9CC20D2FFC820D9-607
51384 ? CC202ECCC010D0EA-528
51392 ? A92020D2FFAD75CE-56A
51400 ? 20D2CB20D2CB800?-4D7
51408 ? CD7CCEF00BA95820-503
51416 ? D2FF2030C84C57C8-52C
51424 ? 20D2CB80F8CD7DCE-65D
51432 ? D0EBAD75CE8D993A69F
51440 ? CED00E2030C8A991-4EE
51448 ? 20D2FF4C7FC94C57=51F
51456 ? C8A0008C7CCE8C7D=447
51464 ? CE2DD2CB80F091FE=5BF
51472 ? 20CEC9F27CED0=4D3
51480 ? F020D2CB80D7C=59E
51488 ? CEF008A95820D2FF=4D8
51496 ? 4C57C820D2CB80C4E
51504 ? CD7DCEF0034C23C=473
51512 ? 20KCB20D3CBAD75=409
51520 ? CEA8A9009993CEAD=506
51528 ? 84CEC902D02520BC=436
51536 ? CBA9C820F3CBA955=568
51544 ? 2016CD9580F3CB=432
51552 ? 20CTCB9C73CE8D8=54F
51560 ? B993CED0239B0F7=5D4
51568 ? 4C5BC7A9552016CD=3DF
51576 ? 20F1CB4C63C9AC77=4EF
51584 ? CE20D2CB80F0A20=57D
51592 ? D2CB20D2CB4C47C=53E
51600 ? 4C5CC8A52B85FBA5=4F5
51608 ? 2C85FCA000B1FB99=52A
51616 ? 2200C8B1FB5323F=4CE
51624 ? 0BA5228SFB52385=447
51632 ? FC4C9BC3189SFB69=57D
51640 ? 02852D852F8531R5=37B
51648 ? FC690052E853085=412
51656 ? 3260206SCCA9020E=3E1
51664 ? 84CEA9BBD0D0=4B3
51672 ? 8E81CE0C82CEA200=533
51680 ? A9098DCD6C20CFE=4D4
51688 ? C914F016C90FF051=4E2
51696 ? 20CEC9F20D2CFBD=544
51704 ? C3CEE84CE5C6D00=54A
51712 ? D0E3E000F0DF20D2=554
51720 ? FFC94CE5C9C9300=554
51728 ? D4CC93A9F548ADC3=444
51736 ? CEC924F004C8AC5=440
51744 ? C968C9410BFC947=4BA
51752 ? B0BF20D2FF38E930=4D5
51760 ? A0A9002C9D7E005=36A
51768 ? F0BE9CCE5E84CE=5A1
51776 ? C9E000F0A0E001D0=52A
51784 ? 07ADC3CE92C94F095=4FF
51792 ? A9202D2FFA9FF9D=54F
51800 ? 20D2FFA9FF20D2=5A4
51808 ? DCCE8ED1CE8ED2CE=659
51816 ? ADC3CEC924D006A9=512
51824 ? 0F8DCDCE8SDBC3CE=5BD
51832 ? 20FF01D1CE20D2=5E5
51840 ? 3418B3C3E5DFCE=524
51848 ? 8DCFCE9D00SDD0CE=566
51856 ? 8DDCE8E020E84C75=534
51864 ? CA8DFCEAC83E99=660
51872 ? A5CE5A8D0CE99A3=660
51880 ? 2C1E88C83CEAC82=561
51888 ? CEAE81CE6020250D=4ED
51896 ? A0D0D41CE5A1F0=500
51904 ? 0720D2FFE84CBACA=570
51912 ? 4CDEC9ACEDCE8SDCE=55E
51920 ? CEADCFE8DDNICEM=C1
51928 ? D0CE8DD2CE18ADD1=534
51936 ? CE2DCFCE8DDCFCE=8F
51944 ? D2CE6DDCE8SDDCE=6BE
51952 ? B005CECEFCEDE66A=25
51960 ? 20C3CCA90F8D8602=414
51968 ? A95185FDA9CD85FE=575
51976 ? A000209DCC2025CD=343
51984 ? 209DCC209DCC209D=3DF
51992 ? CC2022CD20A9CC20=3B8
52000 ? 95CC2022CD2095CC=411
52008 ? 202FCE20D2FFE08E=421
52016 ? 81CE8ECE20C9C=480
52024 ? 20ECCC20CCC900=48F
52032 ? D00D20FDCCC931F0=4F0
52040 ? 06200ICC4C35C80=314
52048 ? 80CEA81CEAC82CE=597
52056 ? 60AE92CE9A4C5BC7=4CE
52064 ? 2022CDA9228SFDA9=465
52072 ? CE85FEA000209CC=4BA
52080 ? 20C5DA00FA920994=393
52088 ? 93CE88D0FA8D93CE=619
52096 ? 202FCBC914D010C0=417
52104 ? 00F0F52D2FF08A9=58F
52112 ? 20999CE4C80CBC9=50A
52120 ? 0DF00B2D2FF9993=4BD
52128 ? CEC8C010D0DAA920=579
52136 ? 20D2FF60A920D2=4B4
52144 ? 4F9AF20D2FFA94=8BC
52152 ? 20D2FF60A913D00=452
52160 ? DEA9128D00IE6A9=4CD
52168 ? 538D00DEA9528D00=4E
52176 ? DE60A9961BD87E=547
52184 ? C82CEAC82CE20D4=4D4
52192 ? CC20ECCCE87CED0=677
52200 ? 0238620FDCCB0EE=509
52208 ? 60A9FA0C82EA820=597
52216 ? 04C8D8A9FA82CE=616
52224 ? 602004CC5AA2A8CA=3EE
52232 ? D0FDAA2069CC6020=454
52240 ? 25CDA9020ABCC20=364
52248 ? 95CADBCE20D2FF=573
52256 ? A9020D2FFA9020=3A6
52264 ? ABCC20DBC9604D7D=4BA
52272 ? CE8D7DCE20AD7D=4AA
52280 ? CE2A9010AD7DCE49=411
52288 ? 08D7DCEAD7CCE49=460
52296 ? 20D2FFC8C8C8CE=5B5
52304 ? 7DCECDD8E160A000=516
52312 ? A9009900D4C8C018=44E
52320 ? D0F66A99320D2FF=5B3
52328 ? 6040A9A229F0D1F=37E
52336 ? A5D448A5A2910F0=4A1
52344 ? 05A9A44C80CCA920=42B
52352 ? 20D2FFA9085D4A9=51C
52360 ? 9D20D2FF68SD46=53F
52368 ? 602DD2FFC8B1FDC9=620
52376 ? 21D0F6C980205CD=4B9
52384 ? A90C20BCC2095C=46D
52392 ? 60A9058E81CEAA9=4E6
52400 ? 20D2FFC10D0FA8=603
52408 ? 81CE60C914F000C9=505
52416 ? 7FF0010A9146A0A9=456
52424 ? 7F6020E4FFC9C140=5C4
52432 ? 07C0D0F0A20C98E900=4AF
52440 ? 60C941900EC95B90=494
52448 ? 08C9619006C97BB0=49C
52456 ? 02492060488H480=205
52464 ? 20FFD0034C59C8=533
52472 ? 206BA6860HD00IE=485
52480 ? 49016A9003H900=250
52488 ? AD01DE0448HD00IE=3C7
52496 ? 4902A6A6860200=223
52504 ? CD80FB6D01DE20E=505
52512 ? CC6020250D2020C=373
52520 ? A90D20DFFC60829=A00
52528 ? F06A6A6A6A0930C9=3CB
52536 ? 3A0B2186907D20=21F
52544 ? FF6829F0930C93A=31B
52552 ? 3003186907D20FF=2F4
52560 ? 60444F574E4C4F41=2C4
52568 ? 4420D454E552131=243
52576 ? 2020252454345A9=228
52584 ? 56452135202024 5=1FE
52592 ? 5849542054AF2042=28B
52600 ? 415340432136202 2=2F
52608 ? 205341454520420 0=4BH
52616 ? 5445532128205553=285
52624 ? 4520122055244F50=481
52632 ? 2092205445F205245=204
52640 ? 2020205445F2020=2CC
52648 ? 4N54E552029214 5=28C
52656 ? 4E5445522044E554D=2F9
52664 ? 4245522021494620=281
52672 ? 4445522055352020=2E6
52680 ? 495320494E204845=2C8
52688 ? 582C119D9D9D9D9D=476
52696 ? 9D9D9D9D9D9D9D9D=50D
52704 ? 9D9D9D9D5052454E=481
52712 ? 4958205745544820=305
52720 ? 2421535441525420=2E3
52728 ? 4144445245535320=3E1
52736 ? 4E4F52204F5420=2F0
52744 ? 2021464944E414C20=1D3
52752 ? 4144445245535320=236
52760 ? 464F52204152454=238
52768 ? 2021505224F47524=220
52776 ? 4D205449544F4520=237
52784 ? 284D415820313620=1E5
52792 ? 4348415227532920=219
52800 ? 21124E4F52205641=21B
52808 ? 4C494492C2205452=205
52816 ? 592041474149E20=249
52824 ? 3R2021444953432=216
52832 ? 4F52205441504520=2E8
52840 ? 2820442F542020=1B8
52848 ? 3F210000000000=0D0
```

A reminder of how to use the Telsoft service.

download is on line, make sure your modem is set up and that the number appropriate to its speed. As soon as you hear the modem tones switch the modem to line and replace the receiver. Select Option 1 from the menu — Receive. After a block of data is received you will see "OK" printed if there are no errors, otherwise the program will wait for the blocks to come round again. When the "Program loaded OK" message appears return to the Telsoft service. Select Option 5. You can now save and run.

Option 6 for CBM-64

Note that CBM-64 owners will need to use Option 6 if machine code is to be saved.

Figure 1. BBC.

```
10 REM BBC HEX CODE LOADER
15 HIMEM=&69FF
20 CLS:PRINT
30 INPUT " START ADDRESS (Hex)";A$
40 A=EVAL("&"+A$)
50 IF A>&6FF THEN 200
60 IF A<&2A00 OR A>&6FE7 THEN 20
70 PRINT "A" ";
80 INPUT ":" B$,C$
90 IF LEN(B$) <>16 THEN 50
100 T=0
110 FOR N=0 TO 7
120 X$= MID$(B$,2*N+1,1): GOSUB 300
130 IF E=1 THEN 260
140 X$= MID$(B$,2*N+2,1): GOSUB 300
150 IF E=1 THEN 260
160 B= EVAL("&"+MID$(B$,2*N+1,2))
170 ?A=B:A=A+1:T=T+B
180 NEXT
190 FOR M = 1 TO LEN (C$)
200 B=MID$(C$,M,1):GOSUB 300
210 IF E =1 THEN A=A-1: GOTO 260
220 NEXT
230 IF T= EVAL("&"+C$) THEN 50
240 PRINT "CHECKSUM ERROR !"
250 A=A-8:GOTO 50
260 PRINT "TYPING ERROR !"
270 A=B*(A DIV 8):GOTO 50
280 *SAVE "DOWNLOAD" 6A00 6FB7
290 END
300 E=0:IF ASC(X$)<48 THEN E=1:RETURN
310 IF ASC(X$)<58 THEN RETURN
320 IF ASC(X$)<65 THEN E=1:RETURN
330 IF ASC(X$)>71 THEN E=1
340 RETURN
```

Figure 2. BBC.

```
6A00 : 6C B0F2 91762 00D56D,477
6A10 : C8C475 00F1200C6C,45A
6A18 : 00E3C5 3F0F00B4950,4CE
6A20 : 20E3FF 28F7C7A9A0,7E1
6A28 : 6A200C6C300CFC57B,3C1
6A30 : F000A9F9A9A9A9A9,4A7
6A38 : 676A20C7A820E7FF,429
6A40 : A573A0F0B99956F,3F6
6A48 : A50AC9D20D00D07,419
6A50 : 68A9C80556CA9553,3B0
6A58 : 20386EA9D5200556,290
6A60 : A9150281200F7A9A,48C
6A68 : F7A0A417C0B0B9B5,585
6A70 : AF0519B0F7A9A9A9,3C0
6A78 : 20E3FF20A56DA95A,437
6A80 : 0502A9F0503A987,3D7
6A88 : 0CAC9F020C6C00,340
6A90 : F8A000477B47B04,416
6A98 : 79847A847B057020,380
6A9F : 05AD4F029F8C900,4B9
6A8F : D0E2200C6C8D009,4E0
6A98 : 7100C8200D56DC009,3A4
6A9F : D8F0A000557920,422
6A8F : D00A51C057610A5,354
6A98 : 10A573D57720C6C,209
6A9F : 00F5200 7FC20D5,524
6A98 : A6C0140F7C20D0,5A4
6A9F : 20E3FFA9AF20E3,43D
6A98 : FFA9A820E3FFA8A9,51E
6A9F : 9CA000A6A0E020,41E
6A98 : 8BA2132F4FFA212,387
6A9F : 2BF4FF6A02Y:2F4,4C8
6A98 : FFA29A20F4FFA0A9,553
6A9F : 9CA000A6A0E020,41E
6A98 : 5B20E3FF20E7FF4C,4AC
6A9F : E8A253F4FFA252,4E7
6A98 : 20FF4F68A9A9A5,44F
6A9F : D0E2E7FF4F68A9,380
6A98 : E3FF4C30A4C76A,469
6A9F : A000047A8720D0,2C9
```

```
6C20 : 496CC6BF0023060,374
6C30 : A5B0C9820006207B,369
6C38 : 6B0CC6A0A9A1A201,447
6C40 : 20BF4FF9BA7E8D0F,55C
6C40 : A00AA2D2CAE8CA00,5AA
6C50 : F0A0A0A9A9A7E A0,5B4
6C50 : 2B496C0B00FA4A7E,449
6C60 : A0A9E8A000A2FF20,452
6C60 : F4FFA9B0D50A9A9C,4A8
6C70 : 20E3FF20A06DA9B4,3E4
6C70 : 20B6EA99B502A9,2F8
6C80 : 2B56DC941F000C9,378
6C80 : 4C1E1C9A5B1F74C,3A2
6C90 : 616CA9B0A201F4,335
6C90 : FF4C87AC9B0A2B3,3C4
6CA0 : 20F4FF4CB7ACA9B0,433
6CA0 : A20420FFF6A0A5,4CE
6CB0 : 7C20E5FFA47E20A8,4E8
6CB0 : 6A9B020B0A E20F8,2CA
6CC0 : 6A0B172B5DC941,20B
6CC0 : F0B0C942F011C943,413
6CD0 : FB17AC61AC49B7A2,372
6CD0 : 0120F4FF4C09D6A,37F
6CE0 : B7A2020F4FF4C09,314
6CE0 : 6A0B7A2020F4FF,3D6
6CF0 : E6A0A5BAL9F0B9,441
6CF0 : 9F6A0B0A2012BF,4A9
6D00 : 9CA000A6A0E020,41E
6D00 : FF457F20E3FF2053,495
6D10 : 6C2055AC6A20A8ED,2E5
6D10 : A9B020A0E20F8AD,2C1
6D20 : 20A8D6A9B520B0E,274
6D20 : 2BF86D20A8DA9B5,36B
6D30 : 2B0A6E20FB6D20A8,2D0
6D30 : 6D847EA9B320B0E,2A9
6D40 : A9D220EBFF857C6B,4D0
```

```
6D40 : A98C20E3FF20A8A6D,3EF
6D50 : A9B720D0A6A9A9D5,38C
6D50 : 02A9AE0505A0B020,1A1
6D60 : F86D20A6D2B99A6D,3C0
6D60 : 2B99A6D2B99A6D20A8,317
6D70 : A0A6A9B020A6E20F8,2CA
6D70 : 6D20A8A6D9B720D0,278
6D80 : E620FB6D20A8A6D20,34F
6D80 : E7FF A9D220BFF40,5A0
6D90 : A9BF A2D020FAF6A0,3D5
6D90 : 6A9B020A6E20F8,287
6DA0 : 6D20A8A6D6D20A8D,33A
6DA0 : 20A8A6D20E7FF20E7,445
6DB0 : FF4A8E9F6A6A6A6A,3FE
6DB0 : 6A9B3C9A3A0031B6,1FE
6DC0 : 0720E3FF6A857B05,3AE
6DC0 : 7BA200A57B2A9B0C,380
6DD0 : A57B49B057BA57A,398
6DD0 : 49180573A27A27B,299
6DE0 : CA0BE8A020E3FFC8,5AC
6DE0 : B182C9B0D0FAC8A0,4F7
6DF0 : B67DAAA9202BE3FF,478
6DF0 : CA0BFA6A7D6BC97F,55F
6E00 : D0B0A9A2BFFE8,4F0
6E00 : B0F812A97FC920B0,3C3
6E10 : BEC9B0F0A0C9B0F8,3A1
6E10 : 86C907F02A9B0A8,2D1
6E20 : B57C8A7D847EA991,448
6E20 : A0120FA9FA9A9A2,4B0
6E30 : 0720BFA9FA99A2B0,483
6E30 : 2BFA9F92920FA4B0
6E40 : A47CA99A7A20920A,41F
6E40 : FFA9B5A20420BFA9,464
6E50 : A991A2B020FA9FB0,49F
```

```
6E50 : 09C0B7D0056A0B4C,2C1
6E60 : 0C6A457C6A7D4A7E,3DC
6E60 : 6B47E8A7B6A9A9A9,3E1
6E70 : 0B20BFA9F9B29B1F,3CD
6E70 : 0BA99A62B920BFA9,400
6E80 : 9B109B01B0A7D4A,34B
6E80 : 7E6844AF574E4C4F,2B1
6E90 : A1444A4F4720A045,215
6E90 : 4E550531202B052,195
6EA0 : 45434549564580D34,1F2
6EA0 : 2B20B3145542042,1AE
6EB0 : 617564205261746S,2E6
6EB0 : 0D3520200455849,100
6EC0 : 5420544F2A0415S,200
6EC0 : 49430D454E544552,217
6ED0 : 2B4C5504245520D,1F6
6ED0 : 2D20555345204354,1EC
6EE0 : 524C2D4720544F2,1F5
6EE0 : 5245545555245C2054,254
6EF0 : 4F2D4D45455520F2,1ED
6EF0 : 0D5345542054521,208
6F00 : 4F2D4D45455520F2,1ED
6F00 : 0D5345542054521,208
6F10 : 4E5D4D45A2D4561,24E
6F10 : 7564205261746S0D,292
6F20 : 412D20D37352D42,1EF
6F20 : 617564AD4220D033,1FC
6F30 : 3D3D2A61756A0D,209
6F30 : 432831323D3D2D42,180
6F40 : 617564AD53455420,253
6F40 : 5245434545645D20,221
6F50 : 4261756A0D52617,2C3
6F50 : 6D0D5D2A4D75241,23D
6F60 : AD2D2D4CF414445,1F2
6F60 : 4F2D6F6D0D5D52,200
6F70 : 4555532D414E5920,213
6F70 : 4D455920A6AF5220,210
6F80 : 4D45E5D0D2D20,1A2
```

Figure 1. Spectrum.

```
5 REM SPECTRUM 48k          fig 1
10 REM Hex Code Loader
15 CLEAR 59000
20 POKE 23658,0: CLS : PRINT
30 INPUT "Start Address "a
50 IF a>61135 THEN GO TO 200
60 IF a<6000 THEN GO TO 20
70 PRINT a;
80 INPUT ":";b$
85 IF b$="END" THEN GO TO 200
90 IF LEN b$<>20 THEN GO TO 240
100 LET t=a-256*INT (a/256)
110 FOR n=0 TO 7
120 LET x=b$(2*n+1 TO 2*n+1)
125 GO SUB 300: LET y=x
130 IF e=1 THEN GO TO 260
140 LET x=b$(2*n+2 TO 2*n+2)
145 GO SUB 300: LET y=y*16+x
150 IF e=1 THEN GO TO 260
170 POKE a,y: LET a=a+1
180 LET t=t+y: NEXT n: LET y=0
190 FOR n=1 TO 2
200 LET x=b$(17+n TO 17+n)
205 GO SUB 300: LET y=y*16+x
210 IF e=1 THEN LET a=a-1: GO TO 260
220 NEXT n
230 IF t=y THEN GO TO 50
240 PRINT "Checksum Error"
250 LET a=a-8: GO TO 50
260 PRINT "Typing Error"
270 LET a=8*INT (a/8): GO TO 50
280 SAVE "download"CODE 60000,1136
290 POKE 23650,0: STOP
300 LET e=0: LET x=CODE x$-48-7*(x$>"9")
310 IF x<0 OR x>15 THEN LET e=1
320 RETURN
```

Figure 2. Spectrum.

```
60000 : CD15ED C307ECCD15,4C7
60008 : EDCD36ECCD36EDCD,631
60010 : 5BCDCD4A7EE38FBCD,5AF
60024 : DBEDFE31CA99EAFE,69A
60032 : 35CA87EAC36AEACD,5DB
60040 : 15CD3EFACD04EDCD,5FD
60048 : 15EDC9CD15EDC36A,553
60056 : EACD6AED11E5EE8A,5BC
60064 : 3EEFFD21131BFCCD,45B
60072 : 15EE11CDE6E173E,3D2
60080 : 2D12131BFCCD1FED,3DA
60088 : 3BFCCDBBCDD1FED,3DA
60096 : 3BF8326E5E3E0032,3E9
60104 : 6CEF32AFEF327DEF,544
60112 : 3A5EFCDEC6ED3C,5A1
60120 : EFE6AFDE0200DE0E,427
60128 : 09116SFCD1FEDA,501
60136 : AAEA11CDEBCD0,952
60144 : 20F23A6 9EFE6020,51A
60152 : 0D214B5C3A4BEFBE,36C
60160 : 0847092268FE000,1DA
60168 : 11CDEECD1FED3B9A,47F
60176 : 11213BCCDEBEC79FE,45C
60184 : 1020F03A6BEFCDB1,447
60192 : ECCD1FEDDAAAEA21,574
60200 : 6FEFBE2D133E5B11,326
60208 : E0EE21233E0012CD,340
60216 : D7ECCDA6ECC3AAEA,681
60224 : CD1FEDDAAAEA2178,518
60232 : EFBE2B11E5E3A,524
60240 : 4BEFB56F3E000C67,3CC
60248 : 3E000C2000CCD7EC,4AF
60256 : 3E2132005CC3FFEB,482
60264 : 3E00326FEF327BEF,3C7
60272 : ED5BAEFBE0BCD7,48C
60280 : EDDAAAEA3273EFCD,634
60288 : EBEC3A6EFFEB020,586
60296 : 3A6EFFCD3A6EFFEB,5A6
60304 : EF12130C3A6AEFB9,3FC
60312 : 2BDCCD1FEDDAAAEA,5D8
60320 : 2F3E000C2000CD7EC,4AF
60328 : 1FEDDAAAEA2178EF,5A2
60336 : BEC22DE83E4F32E2,50F
60344 : EE3EA323E3E3E000,498
60352 : 32E4EE3A0B5CFE21,501
60360 : 2083CD15EECD7EC,553
60368 : CDAAEC21E5EE3A6A,5C5
60376 : EF856F3E000C6736,422
60384 : 0021E5EEED4B6AEF,561
60392 : 0C7EF6000C28DE23,4FC
60400 : 0D20F63EFACD84ED,5B9
60408 : 3E0103FEC36AEACD,5E8
60416 : FED3BFCB3DEAF3,594
60424 : 8B63AFD3FF1BF3E,3D8
60432 : 40D3FF3EFFD3FF3E,5AF
60440 : 31D3F3E0F320F5C,385
60448 : 32B05C32485C3E1D,298
60456 : D3FE2219C5CBFEFB,5A8
60464 : CD0DC36A6ACD15,52F
60472 : EECD6A6ED3E1D3FE,556
60480 : 21A5E3E3D0C00FEC,442
60488 : CD04ECCD3A5CCDAA,654
60496 : EC23CD77ECCD77EC,5BF
60504 : CD0AECCD04ECCDAA,661
60512 : EC233E0DCD0FECCD,4CF
60520 : 84EC23CDA3EC3E03,498
60528 : 32EF0CCD0AECCD3E,600
60536 : A3EC3E07CDBFECCD,561
60544 : 84EC23C97E7EE000CB,528
60552 : 2F77EE000CB2F77EE,5A6
60560 : 00CBF53E20CDBBED,520
60568 : F13DC3BFECCDD0EC,650
60576 : CDAAEC21E5EE3A6A,5C5
60584 : CDBBEEFF320C5C,574
60592 : C9F513EE6FBCB1FCB,60C
60600 : 1FCB1FCB1FF63BFE,4CF
60608 : 3AFAC6ECCD7121,498
60616 : F16EBFF63BFE3AFA,686
60624 : D4ECCD7121F3C3BFE,4CF
60632 : CDEEEC5DD4EEC18E,69C
60640 : 173E2077231DFC3E,339
60648 : 0077C9E5217BFAE,538
60656 : 77C5D0E07EA7CB17,449
60664 : 30B07EEEE0773AAF,3C9
```

```
60672 : EFEE10326FEF3721,3D5
60680 : 6EFFCB1623CB16BD,350
60688 : 20C2C1E1C9110501,394
60696 : 21A00CDB583C93E,32F
60704 : 9A3277FCD47EDDA,529
60712 : 2EEDF1C3A6ACDAC,5C8
60720 : ED7BE601F6D23FE,548
60728 : AF2177FE35200237,2FC
60736 : C9CD77ED3E0C9CD,DF8
60744 : 47EEDBFECB37C9,5E6
60752 : F5DBFF3A81EFFE00,5C7
60760 : 20843E3A1B0023E37,107
60768 : D3FDFBF1C9F53A,675
60776 : 81EFFE002B043E36,376
60784 : D3FFCDSBDF1C9E,644
60792 : 00DB0F0437C8DB,59.
60800 : FFE6823CDBDFFE6,626
60808 : 3E0000AD07F7C93A,3E8
60816 : 81EFFE002B043E37,397
60824 : 10023E3ED3FFDB7F,452
60832 : C9CD47D3A73EFDB,5BE
60840 : FIC36EAFC5ED23D,5EE
60848 : 2BDFIC9CDACED3D,62A
60856 : 2BFAC9C5D5E5F5F2,7B0
60864 : F2F2013CDF9EDF0C,537
60872 : 2B0CFEB0D2005E20,2DA
60880 : D7E3B0D7181B3E20,34F
60888 : D7E0B0D73A0B5CFE,4E8
60896 : 2120B33E0BD73E5F,2E6
```

```
60A04 : D73E0B0D7F1ED1C1,648
60A12 : C9FEB7281FCEBC28,4F3
60A20 : 2B1C1E1C9110501,394
60A28 : 10FEB0D20CFE20FA,367
60A36 : 8FEEFEB0F41EE3E,48A
60A44 : 00C93E07C9F51180,3DE
60A52 : 3E02CD1E1C9444F57,4D6
60A60 : 2B4D54E5D0D31202,215
60A68 : 4E550531202B052,195
60A70 : 45434549564580D34,1F2
60A78 : 2B20B3145542042,1AE
60A80 : 617564205261746S,2E6
60A88 : 0D3520200455849,100
60A90 : 5420544F2A0415S,200
60A98 : 49430D454E544552,217
60AA0 : 2B4C5504245520D,1F6
60AA8 : 2D20555345204354,1EC
60AB0 : 524C2D4720544F2,1F5
60AB8 : 5245545555245C2054,254
60AC0 : 4F2D4D45455520F2,1ED
60AC8 : 0D5345542054521,208
60AD0 : 4F2D4D45455520F2,1ED
60AD8 : 0D5345542054521,208
60AE0 : 4E5D4D45A2D4561,24E
60AE8 : 7564205261746S0D,292
60AF0 : 412D20D37352D42,1EF
60AF8 : 617564AD4220D033,1FC
60B00 : 3D3D2A61756A0D,209
60B08 : 432831323D3D2D42,180
60B10 : 617564AD53455420,253
60B18 : 5245434545645D20,221
60B20 : 4261756A0D52617,2C3
60B28 : 6D0D5D2A4D75241,23D
60B30 : AD2D2D4CF414445,1F2
60B38 : 4F2D6F6D0D5D52,200
60B40 : 4555532D414E5920,213
60B48 : 4D455920A6AF5220,210
60B50 : 4D45E5D0D2D20,1A2
```

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Maggot splat

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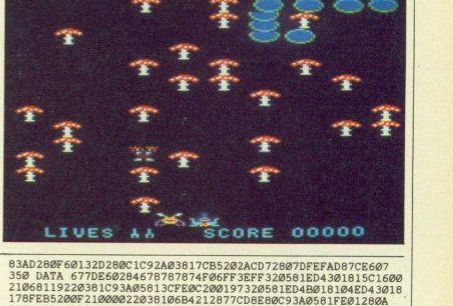
(continued on next page)

Listing 1.

```
 MODE 2:INK 1
,13:PEN 1:PRINT"Assembly in progress,please wait"
10 MEMORY 29999:RESTORE:DIM t(40):FOR a=1 TO 38:READ t(a)
:NEXT a:x=30000
20 FOR a=1 TO 38:t=0:READ a$:IF LEN (a$)<>160 THEN PRINT"
Error in line";:l10+l0*a:END
30 FOR b=1 TO 159 STEP 2:v=VAL ("&"+MID$(a$,b,2)):POKE x,
v:t=t+v:x=x+1:NEXT b:IF t<>t(a) THEN PRINT"Error in line"
;l10+l0*a;" or Line l10":END
40 NEXT a:PRINT"Completed,no errors found":END
110 DATA 4552,2985,3356,8163,7287,4945,960,7402,10178,746
2,8288,4785,8003,4001,6478,516,2436,7825,8765,8114,10035,
9290,9904,7167,8838,8840,10513,9418,9429,9949,6145,9325,9
404,8417,8863,7984,8671,5823
120 DATA 0000CCCC000000CC64CCCC00449BCC6464BB98CCCCCCCC64
CC8B98CC44CC440010200088000010200000000030300000000010200
0000000102000000000102000000000030300000000000000000000
130 DATA 3333000000333C3C3300113C3C3C3C22113C3C3C22363C
3C3C3C39363C3C3C3C39363C3C3C3C39363C3C3C3C22113C3C3C3C22
0333C3C3300000033330000000000000000000142000000001428
140 DATA 0000000014280000000007B4000FC14B47828FC0414F0F0
280804C3C3C3C00840C4C8C0C08000CD89DC000CC086E6E040C00000
0000000000000000000010200000010255240001BAA0000080400000
150 DATA 0000F0F000000005000F0F0A000000F8C3C3F40D54507B0AAA8
A800F0F00054AB5400000A8544ABA8000054540000000000000000000
00000F0A000AAAA50F0F000222250E1D2A0222F0D2E1F03322F0D2
160 DATA E1F03333F0E1E1F0330050F0E1F0332200F0D2F0B1000011
33333300113333332200333333322000000000000008A0080500444
4504400A08844450440A0884441C3C3828800864986490000086EB86
170 DATA EB0000C3C3C3C3000041C3C3820000C3C3000000458A45
8A00000C00040C000000333300000033913333011623391912262333
3333391322339111331100408000220000408000000C0C00000
180 DATA 0000408000000040800000040800000040800000000C0C0000
0000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000
190 DATA 0000000000000000000000000000000000000000CD847B3E
0332CF802100022CD80CD9578CD2879CDD27897CDE578CD2280CD19B
DCD3F7ECD667DCDEF7CCD4F7C3E20CD1B08E92100000222CD803E
200 DATA 0332CF80103CD1C7ECD8478CD9578CD2879CDD27897CDE5
78CD2280CD237ECD19BDCD717ACD667DCD4F7CCDEF7CCD3F7E3E20CD1
EBB2022AD280EF00200CCD6F78FE002D6CD5B7F1EBCD7EC03E3E
210 DATA 783ACF803D32CF8020AFCD1C7EC9211578CDAABCC9010400
00040F0F060021578CDAABCC9010200400010F050021357 8CDAABCC
9040300BC02000F1200CDA7BC214F78CDAABC06E1CD19BD10FBC902
220 DATA 050095600000FF1F21667 8CDAABC0632CD19BD10FBC90202
00640000EFFAFF21D58000087EFEFF200923232310F53E01997C792
124B422D38021FF0022D0809732D280C921A17811D580013200EDB0
230 DATA C940000801300000013000001280000120000100000110000
0110000801000000801000020021FF0C0000FFA800000FF0000FF3ACF8
0FE0E19C53E08CD9479C10C0C0C10F4C92AD80C55F16001922CD00
240 DATA 11102708CD3AC01279112B0E0C0D1279116400D11279110A00CD
12791010C01279C1C9C53EFF3CA7ED5230FA19C609E5CD9479E1C10
C0C0CC997CD0EBC215C7906180E04E5C57ECD9479C10C0C0CE12310
250 DATA F221747997462342E3E5F5CD32BCF1E13CFE1020F0010000
CD38BC907030206010507070707070750009040107090909090970
0000D0014 1406061A1A0F0F0020200000A0A030300E0E10101212131
260 DATA 1818001A8787875F16002D97919E506C1CDFA7F23DD1D106
07DD7E000E02F5E603FE031E0020021E0CFE020021E00FE012001E0
473F1E60C1F1F2B0D20DFDD232323CD118010D1C9060908080809060
270 DATA 000F00060E00080F000E0040404040400E0008080808080F
000E0909050A0909090009080601090600090909090606000000000
00000000040404040E0A0A000609090909090606000000000000
280 DATA 0006090102040800F000E0910201090600A0A0A0F020202
000F080E0101090600030408 0E0909060000F0901020404040000609090
6090906000609090701020C00ED4B00079FEF20133E2FCD1EBBC8
290 DATA CD1E78ED4B3800C00C0C0505050505050578FEBE3032ED43
D000CDFA7FE5CD11B0CD11B07EE1B6239360CD11B360CD11B0360
CDD118 0CD118036 0CD118036 0CD118036 0C904040404CDFA7F3
300 DATA 00CD118036 0CD118036 0021FF0022D080C9CD1180CD1180
CD1180CD118036 0CD118036 0CD118036 0ED4BD002AFBD80F2CB5283
12AF9807DE6FE1F6FCD1B7C2824ED4BF980210000222FB8079E6FE1F
3D1D3A4F3E32CDE578212877CDBE802 1FF0022D080CD0E78C92AFF
007CB528192AFD80CD1B7C2811EBCBF0021000222CD2CDE5781
8D02A03817CB528192A0181CD1B7C2811ED4B0181210000222038 1E
320 DATA 1ECDE57818B0DD21D5803E08F5DD6E00DD23DD66007DEEFF
2819CD1B7C2814DD46020D23DD4E00DD3600FFF13E14CDE5781883DD2
3DD23DD23F13D20CFED4BD80079E6F81F1F1F6F7826FFCD0F7F7EFE
330 DATA 00CB85ED4BD80079E6F81F1F1F4F7826FF24D60C30FF7C87
8747878047798787874FE17EE6033D200297775F7FEE604B3777B87878
047CDFA7F0E040608E53602310FBE1C5CD1180C10D20EF21FF0022
340 DATA D0803E01CDE578CD0E78C97894FE0C300B7995FE0030053E
01FE00C997FE00C9C5ED5BD38079C6079 3FE0F301078C6B92FE173 0
```

Jason Charlesworth hazes bugs.



```
83AD280F60132D280C1C92A03817CB5202ACD72807DFEFAD87CE607
350 DATA 677DE6028467878784F06FF3EFF320581ED4301815C1600
210681192238 1C93A05813CFE0C200197320581ED4B018104ED4 3018
178FEB5200F210000222038106B4212877CDBE80C93A0581FE01280A
360 DATA 219876CD307CCDBE80C9110A00197E220381FE0028EA9732
0581C5E5052128 77CDBE80E1C178C6004778C60C4711 0A00197EFE002
0F3220381ED4301811 8C12AFF807CB5202ACD72807CFEFFC07DE603
370 DATA C60C6787876F8785470EFF7C87878784845F160021068119
22FF80ED43FD80C9ED4BFD800C79FE49200F210000222FF800E4821287
7CDBE80C9ED43FD80E607FE01280A210876CD307CCDBE80C9360023
380 DATA 22FF80C5E579C6004F212877CDBE80E1CD2E78C118DDED4B
F980AFB80FC5202FCD72807CADFEFDC07DE607C6026F8787878744
70EFF7D8787878585 5F160021068119 7EFE00C022FB80ED43F980C9
390 DATA 0C79E601FE01200F215076ED43F980A7791F4FCD8E80C979
FE9220 0F212877E48CD8E80210000222FB80C9ED43F980E60FFE0420D
32322FB607EFE0028CAE5C579A71F4F3D212877CDBE80C1E179C60C
400 DATA 4FE5C5A7791F4F21E076CD8E80C1E179FE9030117 9C6104F
3607237EFE0020E122FB801893210000222FB80C921317ECDDDBCC9213
17E113B7E00810EFFCDD7BCC900005 5B00813B7EFF00CD3D7FC9DD
410 DATA 21D580600EC5CD557ED23DD23DD23DD23C110F1C9DD4E00
DD4601DD5E2D5603F9EFFC87AFE80380304180487D8 14FC5D5217
875CD8E8D1C11DC2F27E7AFE80381CD57AE6015702D7F7D1FE0028
420 DATA 07CD267F1E0C185A1E087AE601571785279FE0020 1ACD267F
1E0C168178FEB420412128 77CDBE80010000110801833FE4820 9CD2
67F1E0C160818E0CD027FFE002020 4 1E08181BFE04300D1E0C7AEE01
430 DATA F68057CD267F180A3EB4905F7AEE01F68057DD7100DD7001
DD7302DD7203CD307CC979E85F81F1F82823D6F8726FF24D60C30FB7
C87878784845D55F160021068119 7ED1C9C5D578C60C4716007C6
440 DATA 084FCD027FD1C1FE00C83600C9CDBC7F7BB2200BED4BD380
21C075CDBE80C9ED4BD380ED43CB807882FEB5200316007 8FEBB20031
60078477983FE493803 1E00794FED43D3807BB2C87AFE0028163 28
450 DATA 023E0B8047D5CDDF7D1FE0028063ACC8032D480ED4BD380
7BFE00281 43C28023E0781 4FCDEA7FFE0002806 3ACBB032D380ED4BD38
021C075CDBE80C911000 3E43CD1EBB280113 5E45CD1EBB280113 4E
460 DATA 1BCD1EBB280113E22CD1EBBC81DC9CDFA7F060897B62310
FCC9CDFA7F060C7EFE00C0CD118010F797C978E6F86F260029545D292
91978E6071717177F6C047D9C97CE638FE3820051150C819C97CC608
470 DATA 67C9060962106813600231 0F0B61EC5CD7280 7DE63CFE3C20
037CE638FE0020057CE628F604475787B0477CE6074F7DE60281 5F878
7874F7AA71F6F8787858321068116005F19360321307 5CDBE80C110
480 DATA BDC9CD0DBD7DAA577CAB5F2A8C0292929219ED5B8C0119
228C0C90DF0E578BE6F86F26002954 5D292919 78E6071717177F6C0470
9D1060CC5SEBD5971213010600EDB012D1EB7CE63BFE3020061 50C8
490 DATA 0918047CC60867C110DEC9408CAC040433E0140 8CFF6C07
00FF9C0301FF6C0800478407 00FF6C0100FF6C0600FF6C02003578030
100008014554518137B4A381209B8C810000000000000000000
```

Maggot Splat

(continued from previous page)

of them are a bit vicious. Never mind you think, you can use your world famous Haze gun — Hurt and Zap 'Em — on them and rid your beautiful garden of all those horrible creepy crawlies.

So the scene is set for an epic show down of man against bugs in this game for the Amstrad. In the game you control the laser base at the bottom of the screen and may move in all directions in your efforts to remove the maggot from the garden. The maggot is however incredibly thick and even though you shoot it, it doesn't realise it's dead but instead splits up and each segment has its it own life. Thus you must shoot each section of the maggot. This task is hampered by the other creatures in the garden. There are also spiders, fleas, and snails.

Shots worth 50 points

Fleas simply drop from above and if they encounter a mushroom, they jump over it. Spiders generally stay away from the laser base but if they hit a mushroom, they poison it so when a maggot hits it the maggot plumets down dead. The touch of any of these creatures is deadly.

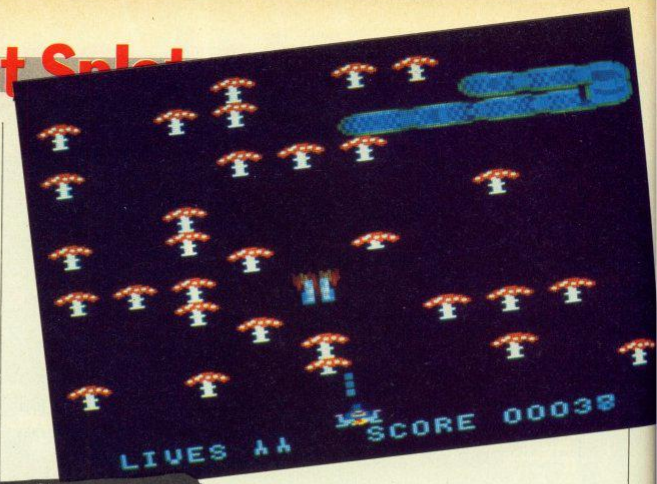
For each snail shot you get 50 points, each spider is worth 50, each flea is worth 30 and each section of the maggot is worth 20. Mushrooms may be shot and each section of mushroom is worth 1 point.

This game is written in machine code and so features very smooth graphics which in the case of the laser base is interrupt driven to give an extra smoothness. The game may be played with either keyboard or joystick.

To set the game, type in listing 2 and save it to tape with SAVE "MAGGOTS"

Next type in listing 1 and run it. If an error is found, correct the error and re-run the program. Repeat this until no errors are found and then save machine code to tape directly after "Maggots with SAVE 'CODE",b,30000,4000

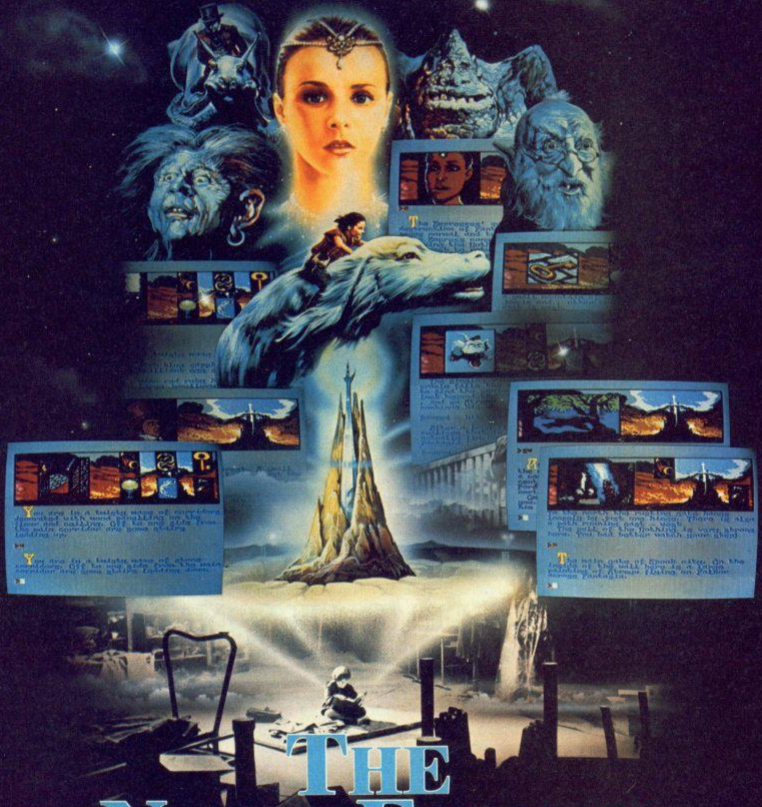
The game may now be run and loaded from the tape with RUN "MAGGOTS"



Listing 2.

```
10 ENV 5,15,1,1
20 ENV 1,5,3,1,5,-2,1,1,0,4,5,-1,1
30 ENV 2,5,3,1,5,-3,2
40 ENV 4,5,3,1,5,-2,1,5,-1,2
50 ENV 3,5,1,1,3,3,1,3,-3,1,5,-1,1
60 DIM n$(6),n(6):FOR a=1 TO 6:READ n$(a),n(a):NEXT
70 MEMORY 29999
80 PEN 1:MODE 0:PRINT"   PLEASE WAIT":LOAD "!"
90 INK 0,0:INK 1,26:INK 2,20:INK 3,6:INK 4,21:BORDER 0
100 PEN 1:MODE 0:PRINT"    MAGGOT SPLAT":PRINT:PEN 2:PRIN
T"  By J.Charlesworth"
110 PEN 3:LOCATE 8,8:PRINT"0  Abort"
120 PEN 4:LOCATE 8,10:PRINT"Q  Up":LOCATE 8,12:PRINT"A  D
own"
130 LOCATE 8,14:PRINT"O  Left":LOCATE 8,16:PRINT"P  Right
"
140 PEN 2:LOCATE 4,18:PRINT"Space  Fire"
150 PEN 1:LOCATE 4,20:PRINT"Or use joystick"
160 PEN 4:LOCATE 4,23:PRINT"Press J for Joystick    or K
for Keys"
170 a$=INKEY$:IF a$="j"OR a$="J" THEN POKE 32704,72:POKE
32712,73:POKE 32728,74:POKE 32720,75:POKE 31355,76:GOTO 2
00
180 IF a$="k"OR a$="K" THEN POKE 32704,67:POKE 32712,69:P
OKE 32728,34:POKE 32720,27:POKE 31355,47:GOTO 200
190 GOTO 170
200 CALL 30633:sc=PEEK(32973)+256*PEEK(32974)
210 FOR A=0 TO 50:a$=INKEY$:NEXT
220 FOR a=1 TO 6:IF sc>n(a) THEN GOTO 280
230 NEXT a
240 MODE 0:PEN 2:PRINT"   Hi Score Table":FOR a=1 TO 6:LO
CATE 2,4+2*a:PEN a+1
250 PRINT n$(a):LOCATE 13,4+a*2:PRINT n(a):NEXT a
260 FOR a=0 TO 2500:IF INKEY$="" THEN NEXT a
270 GOTO 90
280 IF a<>6 THEN FOR b=5 TO a STEP -1:n$(b+1)=n$(b):n(b+1
)=n(b):NEXT b
290 n(a)=sc:LOCATE 1,25:PRINT"                              ";:LOCAT
E 1,25:INPUT "Name ";n$(a)
300 GOTO 240
310 DATA Jetman,1000,Hippo,800,Shaggy,600,Scooby,400,Gree
n Sofa,200,Zarquon,100
```

From the black and white pages of a dusty book emerges the colourful and gripping adventure of



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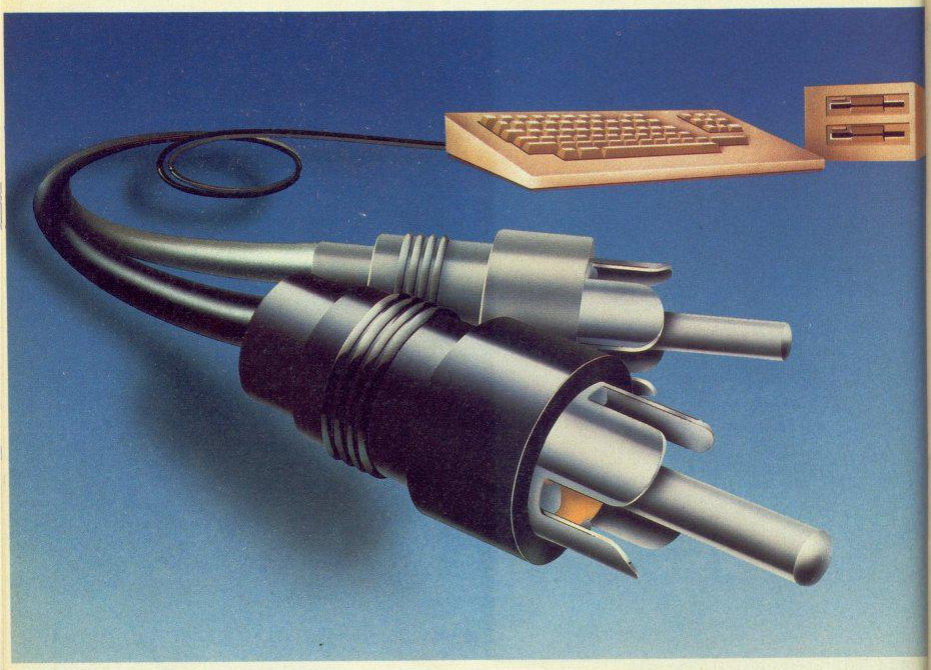

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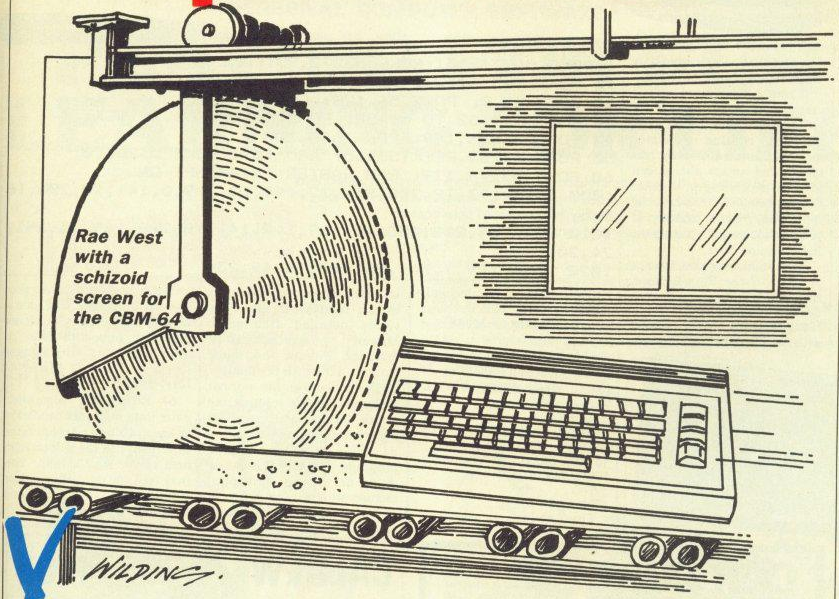

Rae West with a schizoid screen for the CBM-64

You've probably seen adventure games with scrolling text in a few lines at the bottom of the screen, and some sort of picture at the top. Often this effect is produced by dividing the screen horizontally in two parts, with the screen taking part of its information from one display, ordinary text in our example game, and part from another — bitmapped or user-defined graphics characters.

We're not talking here about windows or pop-up menus; these have to be programmed by moving stored-up portions of Ram into the screen, and the overwritten parts have to be stored elsewhere or reprinted. Nor are we discussing the simpler effects where, typically, the border of the screen appears as erratic colured bands, and true interrupts aren't used.

Splitscreen graphics rely on the fact that the screen is scanned from top to bottom 50 times a second or so; the computer is fast enough to be able to take time off its normal tasks to alter the screen's parameters regularly at every scan.

Raster interrupts

Raster interrupts: VIC-II is a chip controling TV output. These are the relevant locations for us:

D013's high bit is bit 8 of the raster scan line.

D012 = 8 lower bits of the scan line; so the maximum range is 0-511. When read, these registers show which screen line is being processed; writing to them sets an interrupt point.

DO1A sets various Interrupts and clears the corresponding flags after an interrupt. We're interested in bit 0; setting this high will cause an interrupt to occur when the TV scan line matches the value put into the two registers above.

D019's bit 0 must be cleared if we wish to cause further interrupts.

Interrupts are used by the 64 to read the keyboard; we'll have to add our own routines. This sort of thing is typical: (i) in Basic, we use POKE 56333,127 to turn off the ordinary, time-controlled interrupts.

POKE 788,0: POKE 789,192 redirects interrupts to $C000 (49152), the 64's free area of Ram. Then, after adding a routine at $C000,

POKE 53274,129 turns raster interrupts on.

"Your Computer", June '85, has my article listing all screen positions avalable on the 64. They are controlled by the contents of DD00 (56576), D018 (53272) and $288 (648). To keep things simple, we'll use two screens, one starting at 32768, the other at 38912. These positions, unlike most others, allow VIC-II to use the inbuilt character set without the need to move it around in memory. However, we do have to poke the top of Basic to prevent it overwriting the screens.

Another actor in the drama is colour Ram: a single block of memory (D800-DBE7) which controls the principal colour in

Assembly language listing.

```
NT  C000  LDA  D012   ;Read raster line
    C003  CMP  £$50   ;Comparison decides whether
                      top or bottom
    C005  BCC  TOP    ;Branch if at top of screen
    C007  LDA  £$00
    C009  STA  D012   ;Next interrupt will be at scan
                      line 0
    C00C  LDA  £$05
    C00E  STA  D018   ;Reset screen to start at 32768
    C011  BNE  EXIT   ;Exit
TOP C013  LDA  £$91
    C015  STA  D012   ;Next interrupt at line 145 —
                      about midscreen
    C018  LDA  £$15
    C01A  STA  D018   ;Reset screen to start at 34816
EXIT C01D LDA  £$01
    C01F  STA  D019
    C022  JMP  EA31   Exit to normal keyboard
                      reading routine
```

(continued on next page)

Split-screen

(continued from previous page)

each character of 8 by 8 dots. The fact that only one block is available can cause problems.

If your'e experienced in 6510 machine langauge, you'll be able to follow how the interrupt handling routine separates incoming inturrupts into two types, and swaps the screen position depending on whether the line being scanned is at the top of the screen or midway. If you don't know ML, just try the Basic version later.

Type in this program, Save it, and Run. (Note: Stop-Restore, then Run 1, will get you back to normal in emergency).

POKE 56576, 149 combined with the interrupt's pokes into D018 (=53272 in decimal) make the screen switch, so the bottom half starts at 32768, and the top half starts at 34816 Now. POKE 648,128 causes Basic to write to the first of these, while POKE 648,132 writes to the second.

0 GOTO 10
1 POKE 56576,151: POKE 53272,23: POKE 648,4: END
10 POKE 56333,127: POKE 788,0:
POKE 789,192:
...ETC...
1020 DATA 169,1,...

This article is just an introduction to the technique: there's insufficient space for really detailed treatment. However, the approach can be extended without too much trouble to increase the number of sprites above the normal meagre, eight by splitting the screen into several zones — *Programming the Commodore 64* has a specimen 32-sprite program, number 12-34 on disc), or to mix bitmapped pictures with text (on disc too).

The technique is quite attractive because of its elegance — very little processing time is used up, and effects which are otherwise impossible can be achieved. Some programmers love it — like Jeff Minter of furry animals fame.

64 Roms vary somewhat: older Rom machines handle the space (blank) character differently, so the colour Ram area shows odd effects. You may find you 64, with an older Rom, doesn't run the Basic program very successfully.

Demo program

```
0 GOTO 10
1 POKE 56576,151:POKE 53272,23:POKE 648,4:END
10 POKE 56333,127: POKE 788,0: POKE 789,192
20 POKE 55,0: POKE 56,128: CLR
30 FOR J=49152 TO 49188: READ X: POKE J,X: NEXT
40 POKE 56576,149: POKE 648,128
50 POKE 53265,PEEK(53265) AND 127: POKE 53266,0
60 POKE 53274,129: REM RASTER INTERRUPT ON
1000 DATA 173,18,208,201,72,144,12,169,0,141,18,208,16
9,5,141
1010 DATA 24,208,208,10,169,145,141,18,208,169,21,141,
24,208
1020 DATA 169,1,141,25,208,76,49,234
```

Rae West has written a 600 page reference book. *Programming the Commodore 64*, recently published by level Ltd. It is obtainable from Biblos Distribution, Star Road, Partridge Green, Nr Horsham, W. Sussex at £14.90 plus £1 post.

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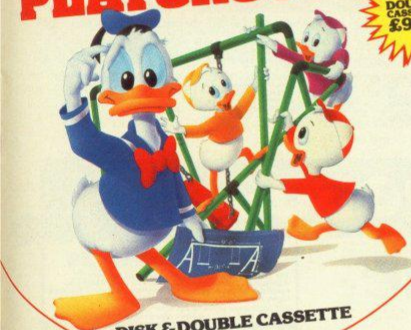

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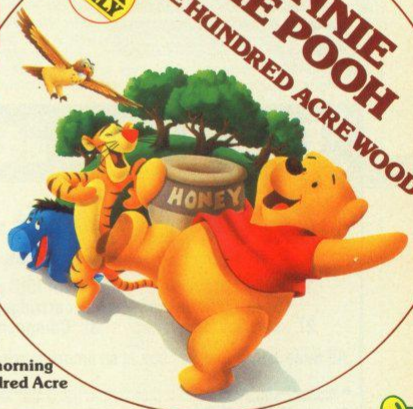

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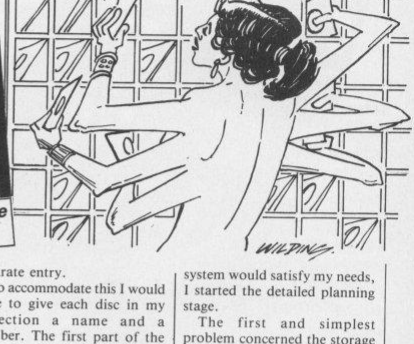

I was mildly embarrassed recently when a friend offered me some non-copyright programs. Instead of the usual muddle of discs they were neatly arranged and numbered in a box on a shelf. What was intriguing was that he had a card index itemising each file and the disc it could be found upon.

The embarrassment came a few weeks later when he returned the visit. Offering to repay the programs in kind I performed my usual scramble through the pile of discs on my shelf and madly started to *Cat them hunting for the file I was looking for.

Card indexes are not for me, the main reason being that I cannot organise myself efficiently enough to update them. But possibly more importantly I don't possess massive stocks of computer equipment for it to sit idly by while I fill out forms.

The specification for this program came from this experience. what I wanted was a program which would allow me to insert the discs one at a time. After inserting the disc I would have the option of rejecting some of the files. The remainder would be filed somehow. When all the discs had been processed, it would be possible to produce a printed listing of the information.

Considering the problem further, it would have to be possible to add to this list as my collection of discs grew, rather than recatalogue the entire file. If a file grew, for example the new information would have to overwrite the old information rather than have it entered as a separate entry.

To accommodate this I would have to give each disc in my collection a name and a number. The first part of the printout would be an ordered list of the discs and their titles. The second part would be a list of the files in alphabetical order, together with the number of the disc that they could be found upon and the filing system information contained upon them.

This seemed simple enough for me to manage. So, satisfied that I could accommodate my ways to the system and that the system would satisfy my needs, I started the detailed planning stage.

The first and simplest problem concerned the storage of the information. With even a moderate collection of full discs it would probably be impossible to hold all the information in the computer's memory and manipulate the information at the same time. So the information would have to be filed on disc and manipulated there.

The second problem was how

Listing 1.

```
 10REM FILE CAT VERSION 1
 20PROC initialise
 30REPEAT
 40PROC catalogue
 50UNTIL done
 60PROC printout
 70STOP
 80DEF PROC_initialise
 90CLOSE #0
 100DIM code% 100
 110REM space for machine code routine
 120DIM data% 1240
 130REM space for result of *INFO call
 140chanel = OPENOUT("filecat")
 150IF channel = 0 THEN channel = FN_make_file
 160CLOSE #channel
 170OSCLI + AFFP7
 180FX 4,1
 190PROC_assemble
 200done = FALSE
 210ENDPROC
 220DEF FN_make_file
 230REM produce file with default header
 240LOCAL channel
 250channel = OPENOUT("filecat")
 260FOR loop = 1 TO 66
 270BPUT #channel,&D0
 280NEXT loop
 290PTR = channel + 2
 300BPUT #channel,0:BPUT # channel , 0 : BPUT # chann
el,0: BPUT #channel ,2 : BPUT #channel ,0
 310REM first disc number null,null,null & No. of rec
ords 2
 320PTR=channel = 0:BPUT #channel, &FF:BPUT #channel,
&FF
 330REM fist disc title pointer null
 340PTR =channel + 33
 350BPUT # channel, &FF:BPUT # channel, &FF
 360REM first filename pointer null
 370= channel
 380DEF PROC_assemble
 390FOR opt = 0 TO 3 STEP 2
 400P% = code%
 410[ OPT opt
 420LDA #(data% MOD 256)
 430STA &71
 440LDA #(data% DIV 256)
 450STA &72
 460\ base address for characters returned
 470LDA &20E
 480STA orvec
 490LDA &20F
 500STA orvec + 1
 510\ preserve original vector
 520LDA #(revec MOD 256)
 530STA &20E
 540LDA #(revec DIV 256)
 550STA &20F
 560\ install new vector
 570LDX #(star_drive MOD 256)
 580LDY #(star_drive DIV 256)
 590JSR OSCLI
 600\ *DRIVE  command
 610LDX #(star_info MOD 256)
 620LDY #(star_info DIV 256)
 630JSR OSCLI
 640\ *INFO command
 650LDA orvec
 660STA &20E
 670LDA orvec + 1
 680STA &20F
 690RTS
 700\ restore original vector and return
 710.revec NOP : NOP
 720.star_drive
 730]
 740PRINT " 'DRIVE 0 "
 750drive% = P% + 6
 760P% = P% + 8
 770[ OPT opt
 780.star_info
 790]
 800PRINT " 'INFO *.*"
 810P% = P% + 8
 820[ OPT opt
 830.revec
 840\ vectored code starts here
 850STA &70
 860TYA
 870PHA
 880LDY #0
 890LDA &70
 900\ preserve and zero Y register
 910STA (&71),Y
 920\ store character at address in &71/2
 930INC &71
 940BNE no_need
 950INC &72
 960\ increment adress in &71/2
 970.no_need
 980PLA
 990TAY
 1000LDA &70
 1010RTS
 1020\ restore Y and return
 1030]
 1040NEXT opt
 1050ENDPROC
 1060DEF PROC catalogue
 1070CLS
 1080FOR line% = 0 TO 1
 1090PRINTTAB(16,0+line%)CHR$(141);Disc Cat
 1100PRINTTAB(5,3+line%)CHR$(141);Drive :
 1110PRINTTAB(5,5+line%)CHR$(141);Disc No :
 1120PRINTTAB(0,7+line%)CHR$(141);Disc Title :
 1130NEXT line%
 1140REM format screen
 1150dis$=0 : FN_getin(13,4.1.TRUE)
 1160disc_no$ = FN_getin(13,6,3,TRUE)
 1170disc_title$ = FN_getin(13,8,24,FALSE)
 1180IF LEN(disc_no$) <> 3 THEN disc_no$ = STRING$(3-L
EN(disc_no$),"0")+disc_no$
 1190IF disc_no$ = "999" THEN done = TRUE : ENDPROC
 1200REPEAT
 1210IF VAL(disc$) > 3 THEN disc$ = FN_getin(13,4.1.TR
UE)
 1220UNTIL VAL(disc$) < 4
 1230?drive% = ASC(disc$)
 1240PROC_change
 1250REM get and verify users inputs
 1260CALL code%
 1270REM activate machine code routine
 1280no_files = FN_display_all
 1290REM display filenames
 1300PROC_change
 1310PROC_select(no_files-1)
 1320REM select files to be excluded
 1330CLS
 1340PROC_fileit
 1350REM file information
 1360ENDPROC
 1370DEF FN_getin(x,y,len,nums)
 1380REM routine to accept keyboard input
 1390REM in double height. x,y position
 1400REM len - maximum length. nums - numbers only fle
9
 1410temp$ = STRING$(len, " ")
 1420PRINTTAB(x,y-1)temp$
 1430PRINTTAB(x,y)temp$
 1440PRINTTAB(x,y);
 1450got = 0
 1460get$ = ""
 1470REM blank out screen and get ready
 1480REPEAT
 1490key = GET
 1500valid = FN_check(key,nums)
 1510IF key = 127 AND got > 0 THEN PROC_delt
 1520UNTIL key = 13
 1530= get$
 1540DEF PROC_delt
 1550REM double height delete
 1560got = got -1
 1570get$ = LEFT$(get$,got)
 1580VDU127,11,32,10,8
 1590ENDPROC
 1600DEF FN_check(key,nums)
 1610REM check key press against flag and length
 1620IF key = 127 OR (got = len AND key <> 13) THEN =
FALSE
 1630lower = 47 : upper = 123
 1640IF nums THEN upper = 58
 1650valid = FALSE
 1660IF key > lower AND key < upper THEN got = got + 1
:valid = TRUE
 1670IF valid THEN VDUkey,11,8,key,10 :get$ = get$+CHR
$(key)
 1680IF key = 32 AND NOT(nums) THEN VDU32:got = got +
1 : get$ = get$ + " "
 1690= valid
 1700DEF FN_display_all
 1710REM display filenames from *INFO call
 1720top_data = ?&71 + 256*?&72
 1730REM top of list provided by machine code section
 1740no_files = (top_data - data%)/40
 1750REM 40 characters per filename
```

(continued on page 93)

(continued on page 93)

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Disc Cat

(continued from page 91)

to extract the information about the catalogue from the disc. Perusing my copies of the BBC's OS guides it seemed possible but tedious to obtain the information by making a series of system calls — the first to obtain the disc catalogue and subsequent calls for each file in the catalogue. The official way however is not always the most elegant. One official call, *Info*.*, would yield the required information but display too much of the information on the screen, and with a full directory overflow one full screen.

It is here where the wonderful flexibility of the BBC's operating system came to the rescue. Issue the *Info call and trap the information returned before it gets to the screen. Specifically direct it to a reserved area of memory, where the filenames can be extracted for display on the screen and the rest of the information held available for filing. It is possible to do this as most operating system routines are vectored through the user Ram, allowing them to be trapped.

Having written and tested this part of the program, I then started to consider in more detail the structure of the file which would contain the information. As the size of the file was indeterminate, and the information had to be presented in a certain order, it seemed sensible to maintain an ordered file.

There are two choices when doing this. The most obvious way would be to hold an ordered list of disc titles, followed by an ordered list of filenames. Simple to understand but difficult to implement.

If a new disc or filename had to be added to the list it would result in a great deal of shuffling of information on the disc. The second method of storing an ordered list is more difficult to understand and code but much easier to implement on a filing system.

The information is physically stored in the sequence it is collected in. Associated with

Figure 1. Details of a double entwined linked list

(a) before addition of file BBBBBBB

Record number	Pointer	Information
1	3	dummy (start of titles list)
4	7	dummy (start of filenames list)
2	5	title of disc # 1
3	8	filename AAAAAAA
5	0	filename CCCCCCC
7	0	title of disc # 2 (and end of list)
8		filename DDDDDDD
		(and end of list)

(b) after addition of file BBBBBBB

Record number	Pointer	Information
1	3	dummy (start of titles list)
4	7	dummy (start of filenames list)
2	5	title of disc # 1
3	9	filename AAAAAAA
4	8	filename CCCCCCC
5	0	title of disc #2 (and end of list)
7	0	filename DDDDDDD
8		(and end of list)
9	5	filename BBBBBBB

(continued on next page)

(listing continued from page 91)

```
176@FOR loop = 0 TO no_files-1
177@filename$ = FN_get_name(loop)
178@y = (loop DIV 3) + 10
179@x = 3 + (loop MOD 3)* 13
180@PRINTTAB(x,y)filename$
181@REM formatted three across
182@NEXT loop
183@= no_files
184@DEF FN_get_name(ordinal)
185@REM return filename from memory
186@address = data$ + (ordinal) *40
187@lenf = 0 : temp$ = ""
188@REPEAT
189@temp$ = temp$ + CHR$(?address)
190@lenf = lenf + 1
191@address = address + 1
192@UNTIL lenf = 10 OR ?(address) = 32
193@= temp$
194@DEF PROC_change
195@PRINTTAB(0,23)CHR$(136)"CHANGE DISC - PRESS SPACE
TO CONTINUE"
196@REPEAT
197@key = GET
198@UNTIL key = 32
199@PRINTTAB(0,23)STRING$(39," ");
200@ENDPROC
201@DEF PROC_select(max)
202@REM selects files from list for inclusion/exclusi
on
203@pos = 0
204@ons$ = "]" : off$= "["
205@PRINTTAB(1,18)ons$
206@PRINTTAB(14,18)off$
207@REM start with first filename
208@REPEAT
209@key = GET
210@IF key = 139 THEN PROC_MOVE(-1)
211@IF key = 138 THEN PROC_MOVE(1)
212@REM up/down arrow keys
213@IF key = 127 THEN PROC_smudge(pos)
214@REM delete key
215@UNTIL key = 13
216@ENDPROC
217@DEF PROC MOVE(dir)
218@REM move from one file to next
219@IF (dir = -1 AND pos = 0) OR (dir = 1 AND pos = m
ax) THEN PROC
220@y = (pos DIV 3) + 10
221@x = 3 + (pos MOD 3) * 13
222@PRINTTAB(x,y)" ":PRINTTAB(x+12,y)" "
223@REM unmark current file
224@pos = pos+dir
225@y = (pos DIV 3) + 10
226@x = 3 + (pos MOD 3) * 13
227@PRINTTAB(x,y)ons$ : PRINTTAB(x+12,y)off$
228@REM mark next file
229@ENDPROC
230@DEF PROC smudge(pos)
231@REM mark a file as excluded/included
232@address = data$ + pos*40
233@REM first character to filename
234@y = (pos DIV 3) + 10
235@x = 2 + ( pos MOD 3) * 13
236@IF (?address AND &80) = 0 THEN PROC_remove(42,42)
ELSE PROC_remove(32,32)
237@REM flagged by high bit, either mark for exclusio
n or remove marks
238@?address = ?address EOR &80
239@REM change flag
240@ENDPROC
241@DEF PROC_remove(on,off)
242@REM sets or removes deleted markers
243@PRINTTAB(x,y)CHR$(on) : PRINTTAB(x+10,y)CHR$(off)
244@ENDPROC
245@DEF PROC_fileit
246@REM file disc title and files from call
247@channel = OPENUP("filecat")
248@PROC_Filename
249@REM title
250@PROC_Filenames
251@REM files
252@CLOSE #channel
253@ENDPROC
254@DEF PROC_filename
255@REM file disc title
256@extent = FN_extent
257@REM returns length of file
258@ptr$ = 0: old_ptr$ = ptr$
259@REPEAT
260@last_ptr$ = old_ptr$
261@old_ptr$ = ptr$
262@PTR #channel = ptr$
263@ptr$ = BGET #channel + 256 + BGET # channel
264@REM follow chain of pointers
265@this_no$ = CHR$(BGET#channel)+CHR$(BGET#channel)+
CHR$(BGET#channel)
266@this_title$ = "" : len = 0
267@REPEAT
268@byte = BGET # channel
269@IF byte <> &FF THEN this_title$ = this_title$ + C
HR$(byte) : len = len + 1
270@UNTIL byte = &FF
271@REM recover information
272@UNTIL disc_no$ <= this_no$ OR ptr$ = &FFFF
273@REM either disc number exceeded or chain ended
274@IF this_no$ <disc_no$ THEN PROC_no_change
275@IF disc_no$ > this_no$ THEN PROC_append ELSE PROC
_insert
276@ENDPROC
277@DEF FN_extent
278@REM returns length of file in characters
279@PTR #channel = 5
280@records = BGET#channel + 256*BGET #channel
281@= 33 * records
282@DEF PROC_no_change
283@REM disc numbers match
284@IF this_title$ = disc_title$ THEN ENDPROC
285@PTR #channel = ptr$+5
286@FOR loop = 1 TO LEN(disc_name$)
287@BPUT #channel,ASC(MID$(disc_name$,loop,1))
288@NEXT loop
289@BPUT #channel, &FF
290@REM overwrite title and end marker
291@ENDPROC
292@DEF PROC_insert
293@REM insert disc title into chain
294@PTR # channel = last_ptr$
295@BPUT # channel, extent MOD 256
296@BPUT # channel, extent DIV 256
297@REM set last pointer to current eof
298@PTR #channel = extent
299@BPUT #channel,old_ptr$ MOD 256
300@BPUT #channel,old_ptr$ DIV 256
301@REM at current eof write existing pointer
302@PROC_store_name
303@REM followed by rest of info
304@ENDPROC
305@DEF PROC_append
306@REM append title to list
307@PTR #channel = old_ptr$
308@BPUT #channel,extent MOD 256
309@BPUT #channel,extent DIV 256
310@REM set last pointer to eof
311@PTR # channel = extent
312@BPUT #channel, &FF
313@BPUT #channel, &FF
314@REM at current eof write nulls
315@PROC_store_name
316@REM followed by new information
317@ENDPROC
318@DEF PROC store_name
319@REM store new disc title
320@temp$ = disc_no$+disc_title$+CHR$(&FF)
321@FOR loop = 1 TO LEN(temp$)
322@BPUT #channel,ASC(MID$(temp$,loop,1))
323@NEXT loop
324@PROC_added_1
325@REM increase no of records
326@ENDPROC
327@DEF PROC added_1
328@REM increment record counter on file
329@PTR #channel = 5
330@BPUT # channel, (records+1) MOD 256
331@BPUT # channel, (records + 1) DIV 256
332@ENDPROC
333@DEF PROC_filenames
334@REM process filenames from the disc
335@VDU 15
336@REM ensure screen can scroll
337@f_ptr$ = data$
338@REPEAT
339@IF (?f_ptr$ AND &80) = 0 THEN PROC_do_one
340@REM ignore files with first high bit set
341@f_ptr$ = f_ptr$+40
342@UNTIL f_ptr$ >= top_data
343@ENDPROC
344@DEF PROC_do_one
345@REM process one filename
346@full_name$ = ""
347@FOR loop := 0 TO 9
348@full_name$ = full_name$ + CHR$(f_ptr$?loop)
349@NEXT loop
350@full_name$ = full_name$ + disc_no$
351@FOR loop = 14 TO 34
352@char$ = CHR$(f_ptr$?loop)
353@IF char$ <> " " THEN full_name$ = full_name$ + ch
ar$
354@NEXT loop
355@small_name$ = MID$(full_name$,3,8)
356@REM full_name$ includes # ABCDEFG plus disc numbe
```

(listing continued on next page)

Disc Cat

(continued from previous page)

each item of information on record is a pointer to the next item of information in sequence. To add a new record and preserve the sequence you only have to change two pointers.

Such a structure is called a linked list. In this application two such lists are required, one for the disc titles and one for the filenames. A simple picture of a small linked list is shown in figure 1a and 1b. To add filename BBBBBBB to the list in 1a, you need only write the information at the end of the file with its pointer pointing to record 5, and rewrite the pointer in record 4 to point to the new record.

Using this idea, the program keeps a 33-byte record. The first two bytes are the record pointer. For a disc title the next three characters indicate the disc number in Ascii, and the disc title follows terminated by &FF. Following the pointer there is the filename. This is always nine bytes long padded out by spaces if necessary. The filename is followed by its disc number as above and 12 further bytes giving the load address, excursion address and size of file.

The first two records are dummies used to start the disc titles chain and the filenames chain respectively. Bytes 5 and 6 of the first record are also used to indicate the current length of file in records.

The utility operation is straightforward. It starts by asking for the drive to be entered, the disc number and the disc name. When these have been verified you are invited to insert the disc to be processed. You're given a list of files and a chance to switch discs back. On a dual-drive system, switch the disc in and out of the second drive.

A file on the display is highlighted by a pair of arrows on the screen. The highlighted file can be changed using the up and down arrow keys. A file can be deleted from consideration using the delete key. A deleted file is shown enclosed by stars, (*). A deleted file which is highlighted can be restored by using the delete key again.

When all is to your satisfaction press Return to start filing the details. As each file is processed its name is shown on the screen. A side-product of this program should be a testing

of your disc system.

After all the filing has been done, the screen reverts to asking for drive number, disc number and title. More discs can thus be processed in one session. To conclude the session enter the disc number as 999.

The print routine starts by asking for a catalogue title and a date reference. To skip the printout, enter "none" as the catalogue name. The catalogue will be presented as a list of discs and titles in numeric order, followed by the list of filenames in alphabetic order. The list is paged with headings, footings and a page count. Two printer control codes can give details.

The printout routine can be extracted from the rest of the program and used in isolation. Apart from one part it is all contained in the final section of the program starting with PROC-printout. Add to this FN-getin, PROC — delt and FN-ceak and the routine can be applied in isolation. Alternatively for additional copies of the catalogue load the whole program and type PROC-printout from the keyboard.

One final and rather important point. As new files are added the catalogue file Filecat has to grow. To avoid "can't extend" errors, and preserve your data in case of filing system accidents, take a blank disc, copy the Filecat program and the current Filecat file to it, in that order.

(listing continued from previous page)

```
r.plus *INFO details
3570REM small_name$ = $.ABCDEFG
3580mid_name$ = MID$(full_name$,1,13)
3590REM mid_name$ includes $.ABCDEFG plus disc number

3600choice = FN_one_filename
3610PRINT " doing ";mid_name$;TAB(28)"....
3620PROC_file_file(choice)
3630ENDPROC
3640REF FN_one_filename
3650REM decide what to do with filename
3660ptr% = 33 : old_ptr% = ptr%
3670un_decided = TRUE : matched = FALSE
3680extent = FN_extent
3690REPEAT
3700last_ptr% = old_ptr%
3710:old_ptr% = ptr%
3720PTR #channel = ptr%
3730ptr% = BGET #channel + 256 * BGET #channel
3740REM follow chain of pointers
3750:this_full$ = ""
3760FOR loop = 1 TO 31
3770:this_full$ = this_full$ + CHR$(BGET #channel)
3780NEXT loop
3790:this_small$ = MID$(this_full$,3,8)
3800:this_mid$ = MID$(this_full$,1,12)
3810REM full, mid and small correspond to above
3820:this_disc$ = MID$(this_full$,10,3)
3830:un_decided = FN_decide
3840REM finished yet ???
3850WHILE NOT(un_decided)
3860: un_decided
3870DEF FN_decide
3880IF ptr% = &FFFF THEN = 1 : REM append
3890IF this_full$ = full_name$ THEN = 2 : REM do noth
ing
3900IF this_mid$ < mid_name$ THEN = 3 : REM overwrite
3910IF small_name$ < this_small$ THEN = 4: REM insert
3920IF small_name$ = this_small$ AND ASC(full_name$)
< ASC(this_full$) THEN = 4 : REM insert
3930IF ASC(full_name$) = ASC(this_full$) AND small_na
me$ = this_small$ AND disc_no$ < this_disc$ THEN = 4
3940: REM continue testing
3950REM see text for explanation !!!!
3960DEF PROC_file_file(decision)
3970REM take action after decision
3980IF decision = 1 THEN PROC_append_file
3990IF decision = 3 THEN PROC_over_file
4000IF decision = 4 THEN PROC_insert_file
4010ENDPROC
4020DEF PROC_append_file
4030PTR #ch %=0 * old_ptr%
4040BPUT #channel, extent MOD 256
4050BPUT #channel, extent DIV 256
4060REM set last pointer to current eof
4070PTR #channel = extent
4080BPUT #channel, &FF
4090BPUT #channel, &FF
4100REM and set pointer at current eof to null
4110PROC_filing_file
4120REM then add details at end
4130ENDPROC
4140DEF PROC_insert_file
4150PTR #channel = last_ptr%
4160BPUT #channel, extent MOD 256
4170BPUT #channel, extent DIV 256
4180REM set last pointer to current eof
4190PTR #channel = extent
4200BPUT #channel, old_ptr% MOD 256
4210BPUT #channel, old_ptr% DIV 256
4220REM and pointer at current eof to existing link
4230PROC_filing_file
4240REM then add details at end
4250ENDPROC
4260DEF PROC_filing_file
4270REM add full details to current eof
4280FOR loop = 1 TO 31
4290BPUT #channel,ASC(MID$(full_name$,loop,1))
4300NEXT loop
4310PROC_added_1
4320REM increment record counter
4330ENDPROC
4340DEF PROC_printout
4350REM print out filed details
4360on = 1
4370off = 0
4380REM esp=assised printer commands
4390page = 1
4400REM page number
4410PROC_printin
4420REM get input from user
4430IF title$ = "none" THEN ENDPROC
4440VDU2,21
4450REM pointer on screen off
4460channel = OPENUP("filecat")
4470PTR #channel = 0
4480REM write index
4490PROC_title
4500REM write titles
4510VDU3,6
4520REM printer off screen on
4530CLS
4540ENDPROC
4550DEF PROC_printin
4560REM get users title$ for printout
4570CLS
4580FOR loop = 0 TO 1
4590PRINTTAB(0,0*loop)CHR$(141)"Disc_cat printout"
4600PRINTTAB(0,9+loop)CHR$(141)"Title :

4610PRINTTAB(0,5+loop)CHR$(141)"Date  :

4620NEXT loop
4630REM format screen
4640title$ = FN_getin(8,4,20,FALSE)
4650date$ = FN_getin(8,6,20,FALSE)
4660REM get users input
4670ENDPROC
4680PROC_index
4690REM printout index
4700line = FN_heading
4710REM start with page header
4720PTR #channel = 0
4730ptr% = BGET#channel + 256 *BGET#channel
4740REPEAT
4750PTR #channel = ptr%
4760ptr% = BGET#channel + 256 *BGET#channel
4770REM follow chain of pointers
4780num$ = CHR$(BGET#channel)+CHR$(BGET#channel)+CHR$
(BGET#channel)
4790disc$ = ""
4800REPEAT
4810chr = BGET#channel
4820IF chr <> &FF THEN disc$ = disc$ + CHR$(chr)
4830UNTIL chr = &FF
4840REM retrieve details
4850PRINTTAB(15):VDU1,on:PRINT;num$;"  ";disc$: VD
U1,off
4860line = line+1
4870IF line > 55 AND ptr% <> &FFFF THEN PROC_footing
4880REM page full
4890UNTIL ptr% = &FFFF
4900PROC_footer
4910REM print footer ready for new page
4920ENDPROC
4930DEF FN_heading
4940REM header on page
4950PRINT"TAB(25);:VDU1,on:PRINT;"INDEX ";title$ : V
DU1,off
4960PRINT'''
4970n = 6
4980DEF PROC_footing
4990REM print footer and header of next page
5000PROC_footer
5010line = FN_heading
5020ENDPROC
5030DEF PROC_footer
5040REM print footer only
5050REPEAT
5060PRINT
5070line = line+1
5080UNTIL line > 65
5090REM goto end of page
5100PRINTTAB(5);:VDU1,on:PRINT"page ";STR$(page);TAB(
25)date$:VDU1,off
5110page = page + 1
5120ENDPROC
5130DEF PROC_titles
5140REM printout filenames
5150line = FN_heading
5160REM start with header
5170PTR #channel = 33
5180ptr% = BGET #channel + 256 * BGET#channel
5190REPEAT
5200PTR #channel = ptr%
5210ptr% = BGET#channel + 256 * BGET#channel
5220REM follow chain of pointers
5230num$ = ""
5240FOR loop = 1  TO 10
5250num$ = num$ + CHR$(BGET#channel)
5260NEXT loop
5270num$ = CHR$(BGET#channel) + CHR$(BGET#channel) +
CHR$(BGET#channel)
5280num18 = CHR$(BGET#channel) + CHR$(BGET#channel) +
CHR$(BGET#channel) + CHR$(BGET#channel)
5290num24 = CHR$(BGET#channel) + CHR$(BGET#channel) +
CHR$(BGET#channel) + CHR$(BGET#channel)
5300num30 = CHR$(BGET#channel) + CHR$(BGET#channel) +
CHR$(BGET#channel) + CHR$(BGET#channel)
5310REM recover information
5320PRINTTAB(20)num$;"  ";num18;"  ";num24
;"  ";num30
5330REM end print it out
5340line = line+1
5350IF line > 55 AND ptr% <> &FFFF THEN PROC_footing
5360REM page full
5370UNTIL ptr% = &FFFF
5380PROC_footer
5390REM finish off
5400ENDPROC
```

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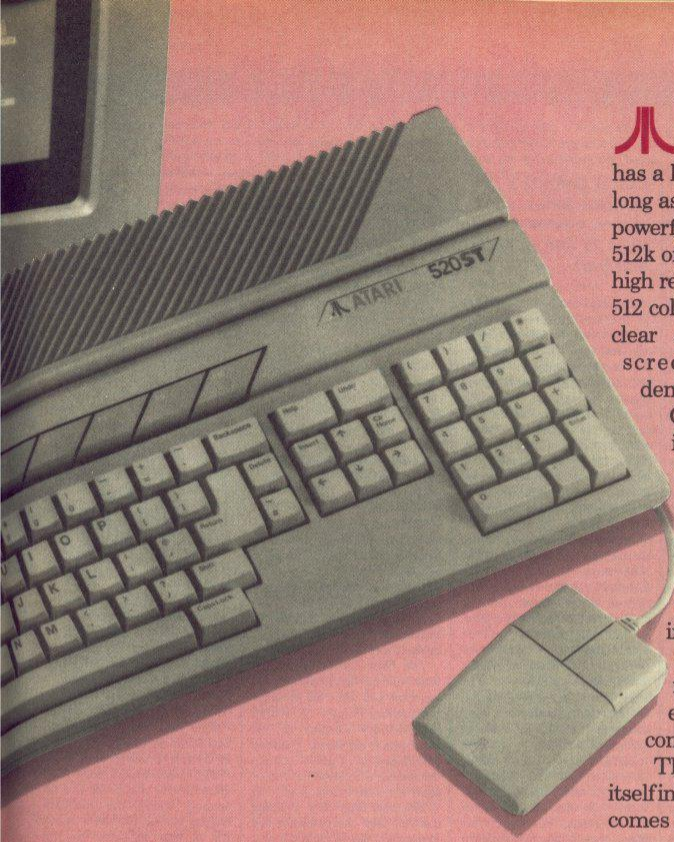

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Megamon

Laurie Sinnett's monitor takes you places you've no right to see in your Amstrad.

Megamon is a sophisticated disassembler/monitor which will work on the complete range of Amstrad machines. Among its many features are an intelligent move memory facility, control over the lower Rom state, machine code trace, read or write object code to tape or disc, full memory dump to the printer, and a disassembly that will even understand all of the 102 undocumented Z-80 instructions. All of the controls are accessed through single key-presses so Megamon is easy to understand and simple to use.

Listing 1 is the short loader program for Megamon. Type this in and save it as the first thing on your tape as "MEGAMON". Listing 2 is the standard hex-loader program which pokes in the hex code from DATA statements. When all the bytes have been successfully entered then the loader program will prompt you to hit any key when ready to save the code. Ensure your tape is positioned after the megamon Basic loader.

To run the program rewind the tape and type RUN "MEGAMON"

When the program has loaded the little screen will appear and you will be asked for an address at which to load Megamon. this can be any address from 4000H up to 9000H. Obviously the monitor will not work if loaded underneath the lower Rom.

Once the address has been entered the object code for Megamon is loaded and you will be presented with Megamon's Front Panel screen display:

Z80 Registers — The top right of the screen shows the Z80 registers AF,BC,DE,HL,IX,IY together with the stack pointer (SP) and the program counter (PC). The register contents are shown (at start-up these are always zero) and then the contents of the memory location addressed by that register. there is also the register cursor (","), which points to AF on start-up. It's use will be discussed shortly.

Lower Rom State — Below the register display the state of the lower rom is shown, either Enabled or Disabled.

Memory Display — The memory display occupies the bottom of the screen and its purpose is to display the bytes around the memory pointer, indicated by ,. The bytes can be displayed either as hex or as ascii.

PC Instruction — The instruction at the Program Counter is contantly displayed above and to the left of the Memory Display.

List Display — The left of the screen above the Memory Display is taken up by the List Display. At start-up this display will be blank, but if you are eager to see it in action then for the moment press L followed by a full-stop. You will see the 14 instructions from address zero disassembled for your perusal.

Unfortunately, space does not permit a detailed discussion of the undocumented instructions, needless to say their use is becoming much more frequent in may of today's top games. Disassemblers that can cope with them are rare and the format for displaying them varies. For example, look at the instruction:

ADD A,IXL

This means "Add A to the low-byte of IX, the "L" tagged on to indicate the low-byte. Alternatively, you can use.

ADD A,IXH

This means 'Add A to the high bye of IXi.e. add A to I. Megamon would display the two instructions above as follows:

i) ADD A,iX
ii) ADD A,Ix

The letter in capitals indicates which byte of the register pair is being operated upon. The same applies to all undocumented instructions that use the IY register pair.

There now follows a list of the Megamon keys and a full explanation of their usage.

The Four Cursor Keys: The four cursor keys above the function pad are used to move the Memory Pointer ">" within the Memory Display in the appropriate direction, enabling you to step up or down through the memory, in steps of one or eight bytes at a time.

The Full Stop Key: Pressing the full stop will advance the Register Cursor >' onto the next register pair in the Register Display.

B — Return to Basic: Pressing this key will produce the prompt "Are you Sure?", In response to this press "Y" if you wish to leave Megamon and return to Basic. Any other key press will return you back to Megamon itself. When Megamon returns to Basic it restores the Roms to whatever they were at start-up.

C — Clear List Window: The List Window can be cleared at any time by pressing the "C" key.

D — Display Memory: This allows you to change the address around which the Memory Display works. You will be asked for a new address for the Memory Pointer — this must be entered as a hex number teminated by a Return. If, instead of a hex number, you

Listing 1.

```
10 MODE 1
20 LOCATE 9,1:PRINT"LAJ Proudly present"
30 LOCATE 14,3:PRINT"MEGAMON"
40 LOCATE 9,5:PRINT"Copyright LAJ 1985"
50 LOCATE 1,7:INPUT "Load address";m:OPENOUT"d"
70 MEMORY m-1
80 CLOSEOUT:LOCATE 1,9:PRINT"Please wait..loading MEGA
MON V. 1.2":LOAD "!MEGAMON.bin",M
100 CALL m
```

Listing 2.

```
100 REM **** HEX LOADER *****
110 ADDR=32768:LIN=1000:MEMORY ADDR-1
120 SUM=0:READ A$,CHECKSUM
130 IF A$="END" THEN 200
140 FOR N=1 TO LEN (A$)-1 STEP 2:X=VAL ("&"+MID$(A$,N,
2))
150 POKE ADDR,X:SUM =SUM+X:ADDR =ADDR+1
160 NEXT
170 IF SUM<>CHECKSUM THEN PRINT "ERROR IN ";LIN  ELSE
LIN=LIN+10:GOTO 120
200 PRINT "DATA CORRECT";CHR$(13);"READY TAPE AND PRES
S A KEY"
210 SAVE "MEGAMON.BIN",B,32768,6127
220 END
 1000 DATA 3EC93200C0F3CD00C03B3BE1FB11F7FF19116614EB1
9E5DDE1DD6E00DD66017CB528182319E5FDE1FD6E00FD66, 5866
 1010 DATA @119FD7500FD7401DD23DD2318DE3A920C8332920C3
2AB0CC60432B20C3EC312215300220100ED73E30E31AA16, 4014
 1020 DATA CDE50ECD65BCCD00B9328E14CD1008CD210FCD03BBC
D440DCD770BCD6B0FCD070BCD1C0BCD18BBCD9B003E03CD, 4882
 1030 DATA B4BBCD6CBBCD11BC28CF3E01CD0EBCCD10081BC521B
500011700FE613802D620EDB1C0909090952E235ED52A7E14, 4586
 1040 DATA C9424345D0D1D2D32E495258464D444C535447504B4
14F57FF1360132D13F712AC12970F69107010FA00860DC8, 4362
 1050 DATA 0D190E460E4F0E740E7D0E8A0EBD0E950E900E9D0EA
B0EB40E3E0FCD630CC5DDE13007C8DD2A80141806200 4DD, 3665
 1060 DATA 2A7C14AF3288143E00CDB4BBCD6CBB060EDD228014C
D290110E7C9DDE5D1CD130C3A8814 3D20ZA3E09CD9702DD, 4729
 1070 DATA E5C5CD921241DD7E00DD23CD400C10F679FE0428053
E09CD97023E20CD9702C1DDE118053E08CD6FBB3E01328C, 4805
 1080 DATA 14C5AF329014DD7E00FEDD2005CD5304184 3FEFD200
A3E01329014CD53041835FECB2005CDD506182CFEED2005, 4557
 1090 DATA CDE3051823FE403809FE03000ACD17031816CD0E031
811FEC03005CDE702180EE607114303CD26033A8914B720, 3828
 1100 DATA 23CDC70278FE202811CDEA0179FE2028093E2CCD970
279CDEA013E0DCD97023E0ACD9702DD23C1C9FE513821FE, 5016
 1110 DATA 592009C5ED4B901481C11810FE6028F3FE5B3808C5E
```

press the full stop key then the Memory Pointer will be set to whatever address the Program Counter currently holds.

The address is displayed, along with its contents. You can either enter a new hex number for this location or press Esc to exit the memory change. When a new number is entered the memory pointer is advanced to the next location and your options are the same again. At any time during the input of a number you can press the Esc key to abort and leave the Memory Pointer unchanged.

E — Toggle Lower Rom State: Press the "E" key and the Lower Rom will be toggled between Enabled and Disabled.

F — Fill Memory: The prompt "Fill>" appears and the number entered here will be the start address for the program to use. You are then asked for the address at which the program will end its fill, and finally the byte to fill the memory with. For example, if you enter 8000 in reponse to "Fill >", 8100 in response to "To >", and FF in response to "With >", the memory between 8000 hex and 8100 hex will be filled with FF (255 decimal).

G — Go: This allows you to execute the object code currently under examination with the use of 'breakpoints, i.e., places at which the object code is stopped in its tracks and control returned to the monitor for you to examine the registers etc.

The address which you enter is response to 'Go>' will be the address at which the monitor starts execution of the object code. As usual with all prompts, if you press the Esc key then the operation will be aborted. You are then asked for an address — "To >" — at which control will be returned to Megamon i.e. the address at which you wish your breakpoint to be inserted.

When you have entered this address Megamon will go off and execute the code. When the breakpoint has been reached, assuming that the code has not caused a fatal crash, a small line will be displayed on the screen and this means that Megamon is waiting for you to press any key before updating all of its displays.

H — Search For String: The prompt "Search For ">" is displayed. You can now enter a sequence of up to 255 bytes which will form the string which Megamon will search for. Each number should be entered by pressing Return and by pressing Return on its own you will terminate the string.

At this stage, assuming the sting can be found, Megamon will update the Memory Display and the Memory Pointer > will be pointing to the second byte of the input string. Also see the explanation of the next instruction, "A".

A — Find Next Occurence: Pressing the "A" key will tell Megamon to find the next occurence of a string you have searched for using H.

I — Toggle between Ascii and Hex: By pressing the "I" key you can toggle the Memory Display Memory so that it shows either Hex or the Ascii equivalents.

L — List: You can enter a new address from which the disassembler will list its 14 instructions. However, there are two other alternatives to entering a new address. If you press the full-stop key in response to List> then the disassembly will begin from the address currently held in the Program Counter.

Alternatively you can press Return in response to the prompt and the disassembly will continue from where it left off.

M — Move a Block of Memory: The prompt move > will be displayed and the address you enter will be the start of the memory block you wish to move. The prompt "End. ," asks you for the end address of the memory block and the prompt "To >" asks you for the destination address for this block. The routine is "intelligent" so that if your destination address lies within the limits of the block you wish to move Megamon takes this into account and performs the move correctly.

O — Read Object Code: This reads a block of object code from in from tape or disc, depending on which system is in use. You are prompted to enter a filename and then an address at which the code will be loaded. Needless to say, you should take care not to overwrite Megamon.

P — Printer Disassembly: With this option you can produce a disassembly of any length to your printer, you could even list the Amstrad Rom. Then first address you enter, in response to "Print ,", is the start address for the disassembly, and the second address is the end. Assuming the printer is connected a disassembly will now appear on the printer which can be aborted at any time by pressing the Esc key.

R — Change Register: By pressing the "R" key you can change the value of the register pair currently pointed to by the register cursor >,. The register pair will take on the value you enter at the keyboard.

S — Single Step: Megamon will execute the current instruction at the Program Counter when you press the "S" key, allowing you to examine the effects of the code upon the registers and memory. This function will aslo single-step through a Call isntruction.

T — Trace: If you press the "T" key Megamon will execute the instruction at the Program Counter in the same way as the "S" function above, except that using "T" allows you to execute a Call instruction automatically.

W — Write Object Code: This writes a block of code to tape or disc under a given filename. You are prompted to enter the filename and then the first and last (inclusive) addresses of the block you wish to write.

X — Toggle Alternative Registers: Pressing the "X" key will toggle the Register Display between AF,BC,DE, HL and the alternate registers AF',BC',DE',HE'. You are advised to leave the values in the alternate register set unchanged as these are in constant use by the firmware (for further details see the *Amstrad Firmware Specification* — Soft 158, Appendix XI).

If the sight of all those hex bytes is enough to put you off then copies of Megamon, recorded on quality blank tapes, are available a cost of £3.50 each, including postage, from Laurie Sinnett, 20 Autumn Street, Burley, Leeds LS3.

```
D4B90148181C1CD410FC9FE183006C61ECD410FC920193A, 4978
1120 DATA 7A72007BC630CD9702C90E2EE23CD97027BCD4
00CC9FE19200B0E20 3E23CD9702CD130CC9FE1A20133E28, 4093
1130 DATA CD97023E23CD9702CD130C3E29CD9702C9FE1B20143
E28CD97023E23CD97027BCD400C3E29CD9702C9FE1C2020, 4371
1140 DATA 3E28CD97023A9014C659CD410F3E2BCD97023E23CD9
7027CCD400C3E29CD9702C9F53A88143D2806F1CD5ABBA7, 4695
1150 DATA C9F1D55FC5CD2BBDF5E53E42CD1EBB2009E1F1C17B3
0ECD1A7C9AF32881431AA16C36000E57DCD410F3A8814B7, 6041
1160 DATA 20043E0F180C3D20073E09CD9702E1C93E06CD6FBBE
1C90F0F0FE607C6396FDD7E00CDF607DD7E00FE90300406, 4357
1170 DATA 07180DFEA03006FE9380218F2410E20C9E60711330
3CD2603C9FE762E1001202028052E11CDF607C9876F2600, 3859
1180 DATA 197E23666FDD7E00E90007CB076E07BE07A507AD07B
107EA070504D4030F0482023220446303260444040D061B06, 2973
1190 DATA 2A0639065306SE06706091065B5F200C2E58CD02087
8FE0BC00651C92E4E0619DD5E01DD5602DD23DD23C9FEC3, 4067
1200 DATA 200F2E4D0619DD5E01DD5602DD23DD23C9FED32008Z
E53061B0E2718AAFEDB200C2E5406070E1BDD5E01DD23C9, 3735
1210 DATA FEE320072E55060F0E0AC9FEEB20072E550609E0AC
9012020FEF320032E56C92E57C9CB5F200C2E50CD020878, 3863
1220 DATA F50B006651C9FEC9012020203032E4CC9FED920032E5
2C9FEE920052E4D060EC92E11060B0E0AC92E4CCD630778, 4184
1230 DATA C61047C92E4DCD63070E19DD5E01DD5602DD23DD231
8E82E4E18EB0F0F0FE607C6396F06070E18DD5E01DD23FD, 4260
1240 DATA 3B204410E20C9FE3DD18F7E6382E4F5F06180E203
E01328C14C9DD7E01FECB202DD7E03E607FE0DDD23C29F, 4590
1250 DATA 05DD23CDD5063E06B92004DE1C1802061CDD66FFC9F
E4002420SDD23E607CA9F05FE07CA9F05FE01201ADD7E00, 4600
1260 DATA CDCB073E0AB920AB82809DD2BDD2BC39F050E59065
9C9FE02223DD7E00FE22201106 1A0E592E11DD5E01DD56, 4069
1270 DATA 0DD23DD23C9FE2AC29F05DE1A065918E8FE03207D
7DE00FE2320072E1206590E20C9FE2BC29F052E1318F2FE, 4393
1280 DATA 04201EDD7E00CDA50778FE04DA9F05FE07CA9F05CDA
A0578FE1CC0DD6601DD23C9FE052008DD7E00CDAD0718DC, 5207
1290 DATA DD7E00FE26200C065B2E110E18DD5E01DD23C9FE2E2
004065C18EEFE36C29F05061CDD23DD66001BE00FE03014, 4327
1300 DATA DD7E01FE76DD23CA9F05CD170 3CDAA05DD6600C9FEC
0300CDD23CDE702CDAA05DD6600C9DD23FEE120072E5006, 5487
1310 DATA 590E20C9FEE52004ZE5818F3FEE92062E4D06601 8E
BFEE320072E55060F0E59C9FEF920072E11060B0E59C92E, 4213
1320 DATA 5F01201BDD2BDD5E00C9260079FE062005DD230E1CC
978FE06200506 1CDD23C9 78FE04380 9FE063005C6574726, 3945
1330 DATA 0179FE04 3809FE06300 5C6574F26017CA7C0 1C39F0
5DD23DD7E00FE003B1321D40601100EDB9C29F0579C662, 4753
1340 DATA 6F01202 0C9FE4DA9F05E607115303CD2603C92E54C
DF6070E7278FE06C00673C92E53CDF6074806727 9FE06CA, 4836
1350 DATA 9F05C92E3CCB5F28022E3ACD020848060AC92E11CD0
200E1ADD5E01DD560 2DDCB005EDD23DD23C078414FC92E, 4095
1360 DATA 74012020FE44C8C39F05012020FE452002 32E75C92E7
6FE4DC8C39F05AF328C14DD7E002E77012018 1E00FE46C8, 4411
1370 DATA 1CFE56C8 1CFE5EC83E01328C14C39F052E110E07FE4
72003067 8C9FE4F20030679C90607FE572003 0E78C9FE5F, 4316
```

(continued on next page)

megamon

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```
1380 DATA 20030E79C9012020FE6720032E7AC9FE6FC29F052E7
BC9A00A1A2A38A9AAABB0B1B2B3B8B9BABAF320C14D0E7, 5798
1390 DATA 1F4E403E130F0F0FE607C646FDD7E01CDF60741012
018122E49FE0308062CFEC8380C1C0F607560181BD23C9, 4188
1400 DATA FE203819CD6307CD9F0E61704DDE5E1DD7E1DCD530
70E192E36DD23C9A720062E1D01202C9FE020062E3701, 4292
1410 DATA 2020C9FE1200A2E1E4020A2E1CD5307180E23ED6F0
1CDD5307651 9DD23C9C5E5C6024F179F47DDE5E109EBE1C1, 4800
1420 DATA C9F50F0F0F0FE607F1F10E2C0F2202E1130140CD20B7
8C604DDCB005E2004470E07C94F0607C9060F7E3D3206, 3752
1430 DATA 0A0E1AD5E1DD5602DDCB005ED23DD23C078414FC
92E12CDF607E20C92E1318F62E11CDF07E18DD5E01DD, 4562
1440 DATA 23C92E12CB5F2801ZCDD02000E20C92E11CB5F28092
E14CD020848060ACC9CD02000E1190D5E01DD5602DD23DD23, 3516
1450 DATA C90F0F0FE607C6156F01202C9F5E6074F1F0F0F0FE
60747C9F50F0F0FE603C608470E2F1C9DD21 4F000607, 4092
1460 DATA C5DD7E00CDB4BBDD6601DD6E02DD5603DD5E04CD66B
BDD7E05CD90BBDD7E06CD96BBDD7E07A72005CD7EBB1803, 5782
1470 DATA CD7BBB11000000FE1C1C0C0C0000000000 1CDD010000010
00F1C0F010000020511211601000000300181271B010000E1, 1674
1480 DATA 1D022709010000051D0B270D010000061D002709010
000204C4F5745522052F4D0D0A0A0D0202004 54E41424C45, 1477
1490 DATA 4400204449534142C45440044146200D0A424320D0D
A44452000A0A44C200041467200D0A424327D0D0A44527 0D, 1999
1500 DATA 0A484C27004950000A5350000A53504550000A30042
26520796F752073775265203F0020202020202020 5265676, 2685
1510 DATA 7374657204696 6C6C00546F005769746800 4D6F76
500456E6004469737006C6179304C6973740048414C5400, 3565
1520 DATA 4C4400494E4300444543004144400052C4341005 25
243410052C4100525241004C4100 4D5345534C4100 5146
1530 DATA 43434000AF5000420030044000500480040C00284
84C290010042430044500484C005350002842430920 28, 1988
1540 DATA 4445290028484C290028535029004E5A005A004E430
04300400500450050000D4A0520455820020202041, 2124
1550 DATA 462C4146270044 0000414400000000 0000355
200534230041E4400584F5200F4F5200535000524C4300, 2442
1560 DATA 5252430052C0052520053 4C10053524100534C4C
0535240004249540052455300535455400525440045000, 2565
1570 DATA 4341 4C005253540050F500044146004558500AF5
55400494E0045580044490045 5534800449580049, 2545
1580 DATA 5900497800695800497900695900497900695900
82900284959290C4444900435049004 94900F555449, 2603
1590 DATA 004C4444004035044004 94E44004F55544400 44495
200435049520094E495200 4F5449520044C4445200435 0, 2628
1600 DATA 4452004 94E4452004F4452004F4452004 2439204
6004E4554 700524554E00524554900494D004900520 0252, 2440
1610 DATA 4C4400476F00546F005726 96E7400535661726 382
0666F720054686556E0020 3E004C6F6164005746172740, 3406
1620 DATA 53617665206676 2F6D004578656375746 96F2E0216
4647206 1736004E616D65 00 3D0000CDB4BBCD6BBB2 0238, 4359
1630 DATA 14DD2A7C14CD6401C9F5CD5B5B2E0004B2101C01C
D75BB2A7E1411F0FF197DE6F86FEB0606CD130C3E3ACD97, 5396
1640 DATA 02CD4E0B10F3CD6 10BE1D1C1F C9F5C506083E20CD9
7021A13CD1E100F4C1F1C93A7E14E6074F8781C606672E, 5169
1650 DATA 03CD75BB3E3CCD97 02C9F5CD5E53E0132861 43E04C
DB4BB210101CD75BB3A8514C603CD4 10F210501CD75BB3E, 4835
1660 DATA 05CD410F216E143A8514A7280321616 4CDE70B3E53
2861421761 4CDE70BCD0BE1D1C1F1C93A8414 3C6F2604, 4265
1670 DATA CD75BB3E3CD9702C93E04CDB4BB3A8414E6073C6F2
604CD75BB3E2CD97 02C9060 4EB3A86146F2605CD75BBEB, 5007
1680 DATA 5E2356233D5D113BCEB3A8614 6F3C32861 4CDD75B
BEBD1 1AC D1E0C10D7C9F57AC D400C7BCD400CF1C9F53A87, 5159
1690 DATA 14A7281AF1P5C50E2EFE203805FE7E3004F79CD970
23E20CD9702C1F1C9F1F5E6F00F0F0F0FFE0A3802C607C6, 5158
1700 DATA 3CD97020F1F5E60FFE0A3802C607C630CD9702F1C9
53E03CDB4BBF1CD410F3E01CDB4BB22E214 2D7DB4BB22E1, 5387
1710 DATA 22ED0822EF0811CDB4BB01D8BBCD1A0D2F8FE5F200B7
BFEED282F1B3E2012189FEDD2832FEFC3728664FFE2E20, 4530
1720 DATA 077BFEED20618677BFEF179200C21EE0811ED08EDA
0EDA0ED8212132B214CD75BB3E07CD410F1B33AED8F8, 5361
1730 DATA 2028 2E1B000021D0BFE7E2028737D7D36380E0A380D60
7171717171 7CB11CB1017CB11CB1017CB11CB1017CB11CB1, 5625
1740 DATA 102318D38EFFA737F5C5CD6CBBC1F1C93EFFA718F3A
F18F0E5C5FEFC280EFE61302D62021310D011300EDB1C1, 5960
1750 DATA 1E1C9303132333435363738394142434445462E5F0D3
E06CDB4BB210101CD75BB3A8514A7C2 0F4CD933A6614F, 3562
1760 DATA 060821800D56CB113802162078F5E0621F1F4C2D4B7
ACD970278D3CB3E20CD97022310E1535A48564E433E0ECD, 3700
1770 DATA 63CC8300 4ED4B7E1ED437E14C1D0B3E03CDB4BBC
D6CBBED5BTE14CD130C3E2CD970210A1CD8C3E20CD97022, 4539
1780 DATA CD720CA7E1436B0D8F7E2323227E1E3CE3ECD6
30CD8C8C53E0DCD630CDA4CEC444EC53E0ACD6 3E0C3E2, 3842
1790 DATA D8C8AFE5ED5230079FE1EBA7E5ED52E3CD0A0E380A5
059C1EB09E803EDB8C9EB5059C103EDB0C9E5A7ED42E1DB, 6870
1800 DATA EBE5A7ED42E1EB3FC93E09CD630CD8C8C53E0ACD630
C3B1C2B1AC53E0BCD630C3B1C2B0F79E1D11A2ED52444, 5114
1810 DATA 626B13EDB0C9C1C1C3C9AB514E2B2B2B4C3C3E0D6D5
30CDB216E143A8414FE043009 3A8514A7280321616143A84, 4335
1820 DATA 14875F16009171230C93A8714EE01328714C9CDD00
B3A84143CE0373284 14C9231B0C2B1B0911F8FF1031108, 3669
1830 DATA 00192278E14C93A8D14EE01328D14CA0B9BC306B93E0
0CDB4BBCD6CBBC93E03CDB4BB3E06CD5445F0CD81BBCD1BBB, 5119
1840 DATA FE79280BFE592807CD84BBCD6CBBC93E01CD0EBC3A8
E14CD0CB9ED7BE30DE90000CD210F3E01CDEBCAF328D14, 5044
1850 DATA CD9B9328E14216E14116F140149013600EDB0F308F
5E122661408D9ED436814ED536A14226C14D9F9B2AE30E22, 4387
1860 DATA 7A14C9AF06842133DF5C5E54648CD32BE2C1C1F3C2
310F1060048CD38BCC9001200000F5C5D5E521870BB7280A, 4943
1870 DATA 57AF01FFFFEDB11520F87EB720CCD97022318F6E1D
1C1F137C9E1D1C1F1A7C93E01328D143E05CDB4BB210101, 5820
1880 DATA CD75BBAFCD410FCD06B9F5CD0CB9F1CB573E01CA410
FAF328D143E02C3410FED738C123E7CCD6C30C3007C8ED4B, 5192
1890 DATA 7C141806200 4ED4B7C14C53E7DCD6C30C3009C1C8C5E
D4B7C141806200 4ED4B7C14C53E7DCD6C30C3009C1D8C5E, 4198
1900 DATA 36CDD111023713270F3D9ED43641DED5362102260 1
0D908F5E1225E1008C1ED7B7A14C5ED737A14316614F1C1, 4886
1910 DATA D1E1D908F1C1D1E1DDE1FDE1ED7B7A14FBC9E32B2B2
B227C14C5D511661 6ED0100ED8D01C1E1F3ED737A1431 6, 6549
1920 DATA 7A14FDE5DDE5E5D5C5F5D9E5D5CD908F500E7B8C1
22A5E10E5F1082A6010ED5B6E1DCD4B641 09F5E1DDE5E1, 4355
1930 DATA 02CD18BBC90000000000000000000000000000003E1328F141
804AF328F14F3D9C5D5E5D908F508CDBA100F08F108D9E1D1, 4155
1940 DATA C1D9FBC9CDBE12EB5F2B7C14ED73BC12213D11ED5E06043
600231DBFEB1D06C5ABB8D022 7C14DD23D11DD7E00EF76CA, 5209
1950 DATA 5911215F120110190 0ED1D1C5A5E1101090 0EDB1CAAA110
10900EDB1CA851101600EDB1CAD4111010800EDB1CAD12, 4118
1960 DATA FEE9CAC111FEDD200BDD7E01FEE9CAC6110D7E00FEF
D200BDD7E01FEE9CAC B11D7E00FEED2021DD7E01FE452D, 6429
1970 DATA 0BDD3600C9DD360100C38511FE4D200BDD3600C9DD3
60100C385113161614F1C1D1E1DDE1FDE1ED5E1ED1E1, 5872
1980 DATA 7B7A140000000000FF3ED737A14317A14FDE5DDE5E5D5C
5F5D9E5D5C5D908F508ED7B8CC12C93A8F14A7C22811CD49, 5979
1990 DATA 12228A12217411CD5012C32811E12A7C14E52A8A122
27C14ED737A1418D4DD7E00FEC92810FC6C2E6FA219C111D, 4800
2000 DATA 0E0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C
FCD491222B81221B91CD5012C32811A8812227C14198, 4227
2010 DATA 2A74141808A7614103A8142A7814227C14C35911DD7E0
14F179F472A7C140922881 2DD7E002A6E14E5FE1282CFE, 3497
2020 DATA 382810FE302812FE202814FE282816FE3C3B911F38F
AC3591 1F1C3591 1F1C3591 1F1C3591 1F1C3591 1F1C3591 1E4B, 5416
2030 DATA 7014F105F5E1226E14ED437014200C4C3591 12A7C14E
D7B7A14E5ED737A14215612410423 10FD4EED437C14C359, 4724
2040 DATA 11DD602DD5E01C9DD7402DD7501C938328218100
800DCFCD4CD4FE4CE4CCDAFAD2C3F2C2EAE2CAC9DBF8D0, 6819
2050 DATA 0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E
0000000DD2A7C14UDE53E01C4CD6401C5D7B5E1E1E1, 5785
2060 DATA ED424DDDE1AF328914C93E7ECD630CC5DDE13007C8D
D2A80141806200 4DD2A7C14 3E7DCD630CD8C8DDE5E1ED42, 5592
2070 DATA 2801DEED43F5132B8013284CD2901DE5E1ED4BF51
2ED422BF238F0E3E0CCD2BBDAF32B814C9000Q3E7FCD630C, 5061
2080 DATA D0C9DD21924DD36000793280B1323B14B200C
D630C3003CB181428F4DD23DD7100 3A8A143C328A1420E6, 4133
2090 DATA 3D328A143A8A14B7C82A7E4100 1FFFF3A8A14EDB1C0C
5ESDD219314 3A8A143D280C47DD7E00BE200DDD232310F5, 4769
2100 DATA E1C1227E14C9E1C118D83E82CD9F13DBC53E83CD630
CD13822282C5C5121524 1120000CD7D7D7D7D7D7D7D7D7D, 6122
2110 DATA 11CD83BCF5D4 7DBCF13007CD7ABCCD6CBBC92100002
B7CB522FB18F2F53E03CDB4BBCD6CBBF1CD410F3E81CD41, 6122
2120 DATA 0F2152141600CD18BBFEFC2836FE0D2837FE2038F1F
E8030EDFE7F201714152BE52B153E80CD5ABB3E20CD5ABB, 4738
2130 DATA 3E20CD5ABB1D20F7CD5ABB1D20F7A128CC7379CD5ABB23141BC
3CD6CBB37C9D5CD6CBBC1C1C3CB1A7C93E84CD630CDBC7C53E7DCD, 6040
2140 DATA 630C38382836C53E85CD630C382D282BC53E86CD9F1
3382221521411100A9CD8CBC301B3E02C1E1D1D5A7ED52EB, 4629
2150 DATA E1CD9BBC300CED8FBCCD6CBBC9E1E1E1C9E1E1E1CD9
2BC0C6CBBC9000000000000000000000000000000000000, 4860
2160 DATA 000540050750A0066006300690 0F0072007500780
07B0081009600900B100CF00D100D300D500D700D900DB, 3254
2170 DATA 00DD00DF00E100E300E500E700E900E00E00E00F00F
100F300F500F700FC0060100E0112100212302120C012F01, 3731
2180 DATA 3703130014601520157016016B01750180018301BC
19501A201A701B001B701BA01BDD1C301C501D501D901E, 3564
2190 DATA 01E301F4010502000215021B022402C023002302
F024902E02510250260265026902E02780278028002, 1930
2200 DATA 85028A028E02930298028E02C102C402C902CC02DB02
26903 02E3 03 1022D3323D334D336D338D3A33A033C33E, 2777
2210 DATA 03400344 2D3440344603443 4A3C4C3E4E3500352035
40356035803A035C035E036003DA0307041104630460 4, 1878
2220 DATA 7C0492A04A104C704E404F204F80FD4000514053 60
54D550055305005 3500E005F4050106060609606F061, 2756
2230 DATA 0626063206306B065B066D06710 68E06F06D606E06F
F060C0710074107 4B077407A7078 7078C07C507D307DA7110B, 2931
2240 DATA 150B180B2B0B390B3E0B4 10B4B0B5B0B6B0B7B0B30
B7D0B8B0B900B9B0B9E0BA10BA10BA70BA8AAF0BB20BB50BB, 2906
2250 DATA 2B0C0BC0C0BD50BE30BEA0BF90BFD0BC20CD0C150C1
90C1C0C340C390C4F0C5E0C6A0C6F0C750C7B0C7E0C810C, 2926
2260 DATA 87 0C8B0C8F0C8B0C8F0C8B0C8F0C8B0C8F0C8B0C
D5E0D720D7AD0B80D8F0D930D960DA2D8A50DA8A0DA8E0DB3, 3653
2270 DATA 0DB60DB90DC30DC4 0DD2 0DD50DDE0DF30D1B0E230E2
D0E460E8A0E510E550E580E5F0E65 0E680E740E790E7D0E, 3133
2280 DATA 000E860E990E9D0EA2 0EBB0ED0ED F0EE50EEE0EF40
EF70EFA0EF0F0F0F0F0F0F0F0F0F 0F150F1A0F1D0F240F450F590F6D, 3304
2290 DATA 0F7C0F8B0F8F0F94 0F9B0F9D0FA40FA90FB20FBB0FC
30FC90FD40FD60FE20FE50FEC0FF20FF70FFA0F0C101510, 4104
2300 DATA 1A102812DB13D 1F04210484 0C10501057106B10711
07D108A108E109210951 0A10A10A10B210510D10E210E10FD101611251181 3A1143114
6115A115E116211651161681 6A1170117511 5D1171C11, 3009
2320 DATA 801190119611991191D11A11A511AA11AD11B011B31
1B611B911BC111C611CB11CE11D11DB11DF11E511FE, 4619
2330 DATA 11E4120A121012161221A1221122522A122D1231123
6123912431 2A1 2F1296129912A81 2AE12B812C012C512, 3306
2340 DATA D312D812DB12E12F112F912FF12071301 3C1131320
324132A132D133213381341134413581340D0050004F0411, 2746
2350 DATA 0B3248804 3B003F004200470D80E058B06CB00C
D06213691372 3B113A913AE130114091413141D142214, 2699
2360 DATA 0030300200300300100300E0030300300300300300300
0303030300200300300100300E0030300300300300300300, 1520
2370 DATA END,0
```

ATARI 520ST SPECIFICATION

MEMORY
128K RAM (524,288 bytes)
192K ROM expandable to 320K
Plug in cartridge port - plug in ROM cartridges
256K TOS operating system

GRAPHICS
Individually addressable 32K bit-mapped screen with 3 screen graphics modes:
320x200 pixels in 16 colours (low resolution)
640x200 pixels in 4 colours (med resolution)
640x400 pixels in monochrome (high res)
16 shades of grey in low res
512 colours available in low/medium res
8 levels of each of red, green and blue

ARCHITECTURE
4 custom designed chips
GLUE Chip - MMU Memory Mngmnt Unit
DMA Controller - Graphics Processing Unit
16/32 bit Motorola microprocessor at 8MHz
eight 32 bit data registers
eight 32 bit address registers
16 bit data bus/24 bit address bus
7 levels of interrupts/56 instructions
14 addressing modes/5 data types

DATA STORAGE
High speed hard disk interface
Direct memory access 1.33 Mbytes per second
CD (Compact Disc) interface
Built in cartridge access
Dedicated floppy disk controller

DISK DRIVE
500K (unformatted)/single 3½" floppy drive
340K (formatted) storage capacity

SOUND AND MUSIC
Sound Generator
Frequency control from 30Hz to above audible
3 voices (channels) - in stereo shaping sound in addition to a noise generator
Programmable shaping and volume controls
Dynamic envelope controls
ADSR (Attack, Decay, Sustain, Release)
Noise generator
MIDI interface for external music synthesizers

KEYBOARD
Separate keyboard microprocessor
Standard QWERTY typewriter styling
Ergonomic angle and height
95 keys including 10 function keys
Numeric keypad - 18 keys including ENTER
One touch cursor control keypad

MONITOR
12" screen - high res monochrome monitor
640x400 monochrome resolution
Note: Some of the above specifications are pre-release and may therefore be subject to change

VIDEO PORTS
Display - Low Resolution - 40 columns
Med/High Res - 40/80 plus colds
Medium res RGB (Red/Green/Blue) output
High resolution monochrome (Black & White)

COMMUNICATIONS
Bidirectional centronics parallel interface for printers, or modems capable of input/output
RS232C serial modem/printer interface
VT52 Terminal Emulation Software
Maximum Baud Rate up to 19,200
High speed hard disk interface
Floppy disk controller (Western Digital)
2 joystick ports (one for 2 button mouse)
MIDI interface for external music synthesizers

GEM WIMP ENVIRONMENT
WIMP - Window Icon Mouse Pop-down menus
Two button mouse controller
Icons/Pull down menus/Windows
GEM VDI - Virtual Device Interface
GEM AES - Application Environment Services
GEM 667 - Bit Block Transfer
Real time clock & calendar

SOFTWARE
GEM environment
with user friendly Macintosh style operation
TOS - Transient Operating System
Atari's own system based on CP/M 68K with hierarchical directory & file structure plus a host of MS DOS & UNIX command structures
GDOS - Business Operating System
to run any standard BDS business programs
GEM desktop
with GEM PAINT graphics mgmt system and GEM WRITE word processor
Personal BASIC and DR Logo
originally written by Digital Research (DR)
Very much like those on other machines except for the extensive use of pull down menus, mouse control and windows

VARIOUS
Dimensions: 470mmx240mmx80mm
Replaceable external power supplies
Expansion: 31 pin port for up to 640K/1,000K
(Cables can be connected)
3V 15Mb hard disc
CD (compact laser disc)
Dot matrix & bi-wheel printers (black)
Thermal dot matrix (colour)
RGB & monochrome monitors

LANGUAGES
BASIC & LOGO supplied
Many others will soon be available, including:
Assembler, BCPL, C, Cobol, Compiled Basic
Lisp, Modula-2 and Pascal

MACINTOSH v F16 v 520ST

"Imagine a Fat Mac - the 512K Apple Macintosh - but with a bigger screen, a far bigger keyboard with numeric keypad, cursor and function keys, and colour. That gives you some idea of what the Atari 520ST is like, except for two important things. First the Atari seems faster. Second the Atari system is about one third of the price."
June 1985 - Jack Schofield - **PRACTICAL COMPUTING**

FEATURES OF BASIC SYSTEM	APPLE MACINTOSH	APRICOT F1a	ATARI 520ST
Price Includes B/W Monitor	YES	NO - extra £200	YES
Keyboard size mm (L x D x H)	330 x 147 x 50	450 x 167 x 28	470 x 240 x 60
Keyboard size ins (L x D x H)	13 x 5¾ x 2	17½ x 6½ x 1	18½ x 9½ x 2½
3½" D/Drive (Unformatted)	500K	500K	500K
3½" D/Drive (Formatted)	396K	315K	349K
WIMP (Window, Icon, Mouse...)	Apple	ACT - Activity	GEM
Real-time Clock	YES	YES	YES
Polyphonic Sound Generator	YES	NO	YES
RS232 Serial Port	YES	YES	YES
Centronics Parallel Printer Port	NO	YES	YES
Dedicated Floppy Disk Controller	NO	YES	YES
Hard Disk DMA Interface	NO	YES	YES
Full stroke keyboard	YES	YES	YES
Number of keys on keyboard	58	82	95
Numeric Keypad	NO	YES (16 Keys)	YES (18 keys)
Cursor Control Keypad	NO	YES	YES
Function keys	NO	10	10
16-bit processor	68000	Intel 8086	68000
Processor running speed	8MHz	4.77MHz	8MHz
RAM size	512K	256K	512K
Number of graphics modes	1	4	3
Number of colours	Monochrome	8	512
Max Screen Resolution (pixels)	512 x 342	640 x 256	640 x 400
Mouse included	Single Button	NO - extra £85	Two Button
Replaceable External Power Pack	NO	NO	YES
Cartridge Socket	NO	NO	YES
Centronics Ports	NO	NO	YES (two)
MIDI Synthesiser Interface	NO	NO	YES
Monitor Size	9"	9" - extra £200	12"
RGB Video Output	NO	YES	YES

System Cost with: Mouse - Monochrome Monitor - 512K RAM - 500K Disk Drive

Price of basic system (exc VAT)	£2595+VAT	£995+VAT	£652+VAT
+ Mouse	Included	£85+VAT	Included
+ Monochrome Monitor	Included	£200+VAT	Included
+ Expansion to 512K RAM	Included	£295+VAT	Included
Price of complete system (exc VAT)	£2595+VAT	£1580+VAT	£652+VAT
PRICE rounded down including VAT	**£2,984**	**£1,362**	**£749**

"The new Atari ST computers truly represent to the consumer what Jack Tramiel is saying — easy-to-use computing power without the price."
March 1985 - **ANALOG COMPUTING**

"It (the ST) uses the most modern technology that is affordable, in a package that gives a professional impression."
May 23rd 1985 - **POPULAR COMPUTING WEEKLY**

"The Atari ST is one of the most elegant designs I have seen. Atari has used an original and elegant method of memory management which should make the ST faster than any other PC on the market - in any price bracket ... The 64K dollar question is would I go out and spend money for one? To which the only answer is 'Try and stop me!'"
John Lambert - July 1985 - **ELECTRONICS & COMPUTING**

"The 520ST is technically excellent ... The 520ST hardware is the new standard by which others will be judged."
July 1985 - **YOUR COMPUTER**

"Atari's new corporate image as an aggressive low cost computer maker is likely to mirror that of Commodore where Mr. Tramiel established the mesmo that 'Business is war.'"
August 21st 1984 - **FINANCIAL TIMES**

"This is the only personal computer I know of that comes with a Midi interface as standard."
Peter Bright - March 1985 - **PERSONAL COMPUTER WORLD**

"The (GEM) version running on the Atari 68000 machines will have the additional advantage of leaving the PC version standing ..."
April 6th 1985 - **PERSONAL COMPUTER NEWS**

"It would seem that GEM offers the ideal operating system."
March 7th 1985 - **POPULAR COMPUTING WEEKLY**

"I found it (GEM) extremely easy to use and was very impressed with the speed of the system. Given the superiority of hardware and operating systems running under the system ..."
Peter Bright - Feb 1985 - **PERSONAL COMPUTER WORLD**

PRESS COMMENT

"The electronics in the machine are a work of art ... The heart of the 520ST is a Motorola 68000, one of the most powerful 16-bit processors around and in many respects it is close to being a 32-bit chip ... when the machine appears in the shops, I'll be at the front end of the queue to buy one."
Peter Bright - June 1985 - **PERSONAL COMPUTER WORLD**

"This machine is significantly more powerful than an IBM PC and it is possible to design a sure-fire winning machine, this is it."
May 11th 1985 - **PERSONAL COMPUTER NEWS**

"... the use of GEM makes the new range of Atari computers so similar to the Macintosh (with the added attraction of colour), that they are already being called 'Jackintosh'."
May 2nd 1985 - **COMPUTING**

520ST

POWER WITHOUT THE PRICE

THE NEW ATARI 520ST

Under the new leadership of Jack Tramiel (former boss and founder of Commodore Business Machines), Atari Corporation have marked their entry into the world of business/personal computers with a machine which leaves the competition standing. Tramiel's slogan 'Power Without the Price' has been implemented in the manufacture of the new 512K Atari 520ST colour computer which offers the user amazingly high performance at an incredibly low price. Launched as a work-station, this new system incorporates seven software packages as well as the 520ST computer with 512K RAM, mouse controller, high resolution monochrome monitor (640x400), 95 key keyboard (with 18 key numeric keypad), MIDI interface, GEM and a 500K 3½ inch disk drive, all for the package price of only £651.30 (+VAT = £749). Dubbed the 'Mac beater' and the 'Jackintosh' (after Atari's Chief, Jack Tramiel), Atari's new machine has been directly compared with the Apple Macintosh RRP £2595 (+VAT = £2985) which offers similar features and capabilities but at a much higher price. Favourably reviewed by the UK's highly critical specialist computer press, the 520ST is likely to make a great impact on this country as a sophisticated alternative to an IBM PC, APRICOT or APPLE MACINTOSH. Unlike its overpriced competitors, the Atari 520ST can be linked up to a colour monitor to unleash a choice of up to 512 colours. The addition of colour brings out the full potential of graphics packages such as GEM.

USER FRIENDLY GEM OPERATING SYSTEM

The power of the ST is harnessed and made user friendly by the new operating system 'GEM' from Digital Research. GEM stands for Graphics Environment Manager and allows a user friendly colour or B/W graphics interface which closely resembles that of the Macintosh. This similarity extends to the use of moveable resizeable windows, icons to represent objects such as disks and disk drives, and the use of pull down menus and a mouse. The advantage of all this is that the computer becomes extremely easy to use. GEM has now been implemented for the Acorn, ACT, Atari, IBM, ICL, and Olivetti. Software written for GEM on one computer should also run under GEM on another computer. This will enable the market to quickly produce a large library of standard interchangeable software.

FREE SOFTWARE AND FUTURE EXPANSION

The Atari 520ST comes supplied with seven free software packages as listed below: 1) TOS - Transient Operating System based on CPM 68K. 2) GEM Graphics Environment Manager by Digital Research (DR) giving a WIMP (Window, Icon, Mouse, Pull down menu) environment. 3) DR GEM Paint for creating graphics masterpieces. 4) DR GEM Write for word processing. 5) Logo learning language to enable you to write your own programs easily using turtle graphics. 6) DR Personal Basic a powerful user friendly version of the Basic programming language. 7) BOS operating system giving you access to dozens of business applications packages already available on the market. Designed with future expansion in mind, the ST also features a host of different interfaces to the outside world and an impressive list of accessories is planned. Atari will soon be releasing a 1000K (1MB) 3½ inch disk drive, and a 15MB hard disk storage system as well as a mass storage compact disk (CD) player capable of storing an entire 20 volume encyclopedia on one disk. A full range of inexpensive printers are planned including dot matrix, daisywheel and thermal colour printers. With its unbeatable graphics, speed and software at a price which is far below that of any comparable personal computer currently on the market, the ST is all set to do battle with the competition. To receive further details of the ST from Silica Shop, just fill in the coupon below with your name and address details and post it to us.

Silica Shop Price: £651.30 + £97.70 VAT = £749.00 This price includes:

★ 512K RAM ★ B/W MONITOR
★ MOUSE ★ 500K 3.5" DISK DRIVE
★ GEM ★ KEYBOARD (95 KEYS)

520ST

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PLEASE SEND ME FREE LITERATURE
ON THE NEW ATARI 520ST COMPUTER

Mr/Mrs/Ms: Initials: Surname:

Address:

Postcode:

Do you already own a computer
If so, which one do you own?

Flexi-Basic

This program is available on Telsoft.

Damian McComb with a CBM-64 program which allows you to change the vocabulary of your micro. Programs can thus be made easier to read and more statements can be fitted onto one line.

Imagine programming your Commodore 64 in French, Spanish, German, or any language you desire. Or simply programming in your own personalised version of Basic. This is now possible with the help of Flexi-Basic.

What the program does is provide you with a Basic-keyword editor with which you can modify or alter any of the Commodore 64's 76 Basic commands, operators and functions. For example you could change the End statement to Terminate, the Goto statement to Jump, the For and Next commands to Loop and Endloop, the + and − operators to Plus and Minus, or the Len function to Length.

Programs written in ordinary Commodore Basic can be listed and edited in a newly defined Basic, making them easier to read and understand. Another use for the program is in fitting more statements into one line. With Commodore Basic each statement takes at least two characters in its abbreviated form, which limits the number of statements per line.

If you re-define some or all of the statements to just one letter, such as P for Poke then four more statements can be fitted onto a single line. then the program can be listed using ordinary Commodore keywords.

The only limitations on the new keywords are that they must have at least one but no more than 10 letters or characters, and only the alphabet and Ascii characters, except space, may be used.

Once a new set of commands has been defined the full Ram is available to the user — 38K. The program only takes up 11 bytes from 695 to 795. This is because the new keywords are stored in the Ram under the Basic Rom.

When the program is run you will see the list of Basic keywords on the screen under a heading Old. This list shows the original Commodore keywords for reference while editing. This list is repeated under another heading New. The New list represents your redefined version of the Basic keywords and can be edited and changed.

A black cursor flashes round the current New keyword being edited. This cursor can be moved up and down the list with the F1 and F3 function keys. If you move over the edge of the list in either direction, a second screen of keywords appears which can be edited in the same way. You can move between the two sets of 38 keywords by moving over the edge of either list.

Together, both screens contain the keywords of all 76 Basic statements. To edit a particular keyword press E when the cursor is flashing over the required keyword. The "cell" is then cleared and the cursor changes colour to cyan to show that you are in edit mode. You can now enter the new keywords which will appear inside the cursor "box".

You may use the delete key for any mistakes. After typing

Listing 1.

```
0 REM ==================
1 REM
2 REM    FLEXI-BASIC  1.0
3 REM
4 REM   BY  DAMIAN MC COMB
5 REM
6 REM          (C) 1985
7 REM
8 REM ==================
10 POKE56,28:A=CL:PRINT"{CLR}PLEASE WA
IT"  E:
20 Z=40:X=1:C=9:V=7:B=16:N=200:P=30720
30 READ(A):IF(A=-1)THEN{SPACE}90
40 PRINT"{HOME}"TAB(14)"  {HOME}"TAB(1
4)"OLD{RTN}{RTN}LEN{RTN}{RTN}"
50 Q=B:FORT=1TO63STEP2:X=MID(Z$,T,2)
GOSUB100:POKEP,L:P=P+X:Q=Q+L:NEXTT
60 E=MID(Z$,A5,2):GOSUB100:CK=L:X$=RI
GHT$(Z$,2):GOSUB100:CK=CK+L*256
70 IFCK<>QTHENPRINT"{HOME}{DOWN}{DOWN}?
DATA ERROR IN LINE"PEEK(63)+256*PEEK(64
)END
80 N=N-X:GOTO30
100 G=ASC(X$):Z=H=ASC(RIGHT$(X$,X))-Z:L
=H+(H<C)*V+B*(G+10.C)*V:L=L/RETURN
1000 DATA 0000007FFFFF7FFFFF7FFFFF7FFF
F7FFFF7FFFFF7FFFFF0000000000000000A6A6
1010 DATA FFFFFFFFFFFFFFFFFFFFFFFFFFFF
FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
1020 DATA 0000BCFFFFFFBFFFFFBFFFFFBFFF
FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
1030 DATA FFFFFFFFFFFFFFFFFFFFFFFFFFFF
FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
1040 DATA FFFFFFFFFFFFFFFFFFFFFFFFFFFF
FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
1050 DATA FFFFCFFFFFFFFFFFFFFFFFFFFFFF
CFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
1060 DATA FFFFFFFFFFFFFFFFFFFFFFFFFFFF
FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
1070 DATA FFFFFFFFFFFFFFFFFFFFFFFFFFFF
FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
1080 DATA FFFFFFFFFFFFFFFFFFFFFFFFFFFF
FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
1090 DATA FFFFFFFFFFFFFFFFFFFFFFFFFFFF
FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
1100 DATA FFFFFFFFFFFFFFFFFFFFFFFFFFFF
FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
1110 DATA FFFFFFFFFFFFFFFFFFFFFFFFFFFF
FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
1120 DATA FFFFFFFFFFFFFFFFFFFFFFFFFFFF
FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
1130 DATA FFFFB32F8E9983FFFF3953E7CF993
FFFF3553B7F1330FFFFFFFFFFFFFFFFFFFFFC15
1140 DATA FFFF3CF9FF9FFFCF3EFFCF7F3F9F9F
7CFF9B9C7B01F7938BFFFE7E7B181E7E7FFA19
1150 DATA FFFFFFFFFFFFFFFFFFFFFFFFFFFF
FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
1160 DATA FFFB3F3953999F9F7B7B7B7C7C7C
783FF831F1831F1101FF8311F103F11183221B
1170 DATA FFE3C3F9F3F9FCF3F9FB111F8F31
103FF8111F8311103FF8111F1E3C7C7C3E8F
1180 DATA FFB3111183111183FF8311118111
103FFFE7E7FFFFFFFFFFFFFFFFFFFFFFFFFFFF
1190 DATA FFE3CF9F3F9FCF3F9FFFF83F8F8F
FFFFC7F9FCFF3C7F7C3F8111F1E3E7FFE77519
1200 DATA FB3393131313F3983F7C8311118111
1210 DATA FF8311118111103FF8111F1E1F1F8F
F81FF8111F8311F1FFF83191911993F8B8B8
1220 DATA FF1111111111111FF81C7C7C7C7C
701FF81E3E3230387FF7C7C7C7C7C7C7C7C7C
701FF81E3E3230387FF7C7C7C7C7C7C7C7C7C
1230 DATA FF1F1F1F1F1F1FB1FF3911101293
93WFF311101010111WFB111111111136080
1240 DATA FFB311118F1F1FFFB311111118
3F1FB311118F1FFFB311118F1FFFB3F11183WF
1250 DATA FFB1C7C7C7C7C7C7F111111111
FB111111938BC7C7C7C7C7C7C7C7C7C7C7C7
1260 DATA FF11C1C7C7C7111111111B3C7C
7C7FFB1E3C7BF190FFB39F9F9F9FB34618
1270 DATA FFC3BFBFBFBFBFBFCF9F9F9F9F
9C1FFE7C3B1E7E7E7E7FBFBFBFBFBFBFBFBF
1280 DATA FFFFFFFFFFFFFFFFFFFFFFFFFFFF
FEFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
1290 DATA FFFB32F8E9983FFFF3953E7CF993
FFFF8733387F1330FFFFFFFFFFFFFFFFFFFFC15
1300 DATA FFE3CF9F9F9FCF3EFFCF7F3F9F9F
3C7FB9B3C7B1C7F9BBBFFE7E7B181E7E7FFA19
1310 DATA FFFFFFFFFFFFFFFFFFFFFFFFFFFF
FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
1320 DATA FFB3B13939398183FFC7B7B7C7C7C
7B3FF831F1831F1101FF8311F1183221B
1330 DATA FFC3C3F9F3F9FCF3F9FB111F8F31
103FF8111F8311103FF8111F1E3C7C7C3E8F
1340 DATA FFB3111183111183FF8311118111
103FFFE7E7FFFFFFFFFFFFFFFFFFFFFFFFFFFF
1350 DATA FFE3CF9F3F9FCF3F9FFFF83F8F8F
FFFFFC7F9FCFF3C7F7C3F8111F1E3E7FFE77519
1360 DATA FFFBC8C3BC8B9191FB0000FF0000
FFFFBF8C3311189C9C9C9C9C9C9C9C9C9C9C
1370 DATA C9B9111313C3B3FFFFFFFFFFFFFF
BFF9191B8CC3C3BF9191919191919191B9C3
1380 DATA 9191919B9191B9191C9C9C9C9C9
9C9191B1BFF0000FFF0000FF1B1B9191B9B9
1390 DATA 9191B1BF1B1B1B1B1B1B1B1B1B1B
9FF9E46C4444476E54A3F2CCD0514BDAFE4D41
1400 DATA A3A8C7C7C7C7C7C7C7C7C7C7C7
8482B0B2A0B1B0B0A0B1A2A2A0B0B0B0B1B4B0
1410 DATA E1E1E1E1E1E1E1E1E1E1E1E1E1
DCD4444C5444C5444CD4B104C5E6C8BC5521110
1420 DATA 3B49B8B13A3A3A1B3A9B9B9B9B
9B9B8B8B8B8B8B8B8B8B8B8B8B8B8B8B8B2D
1430 DATA FFFF5F2C5F5FDC4EFB8FFFFFFFC
0A5FDDFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
1440 DATA 9B2B8189B2B8B8B9FFE7E7E7E7FF
E7E7FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
1450 DATA FFFF8F3E9B3E9B3EFFFF3933E7F993
9FFFF8733387F1330FFFFFFFFFFFFFFFFFFFFC15
1460 DATA FFFB3F3E9B3E9B3EFFFF3933E7F993
9FFFF8733387F1330FFFFFFFFFFFFFFFFFFFFC15
1470 DATA FFFB3C7C7C7C7C7C7C7C7C7C7C7C
7C7FB993C7B1C7938BFFE7E7B181E7E7FFA19
1480 DATA FFFFFFFFFFFFFFFFFFFFFFFFFFFF
FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
1490 DATA FFB3B13939398183FFC7B7B7C7C7
783FF831F1831F1101FF8311F1183221B
1500 DATA FFB3111183111183FF8311118111
103FFFE7E7FFFFFFFFFFFFFFFFFFFFFFFFFFFF
1510 DATA FFC3CF9F3F9FCF3F9FFFF83F8F8F
FFFFFC7F9FCFF3C7F7C3F8111F1E3E7FFE77519
1520 DATA FB3393131313F3983FFC7B3111811
111FF8311118111103FF8111F1E1F1F1F1B3F8F
1530 DATA FFB3111183111183FF8311118111
103FFFE7E7FFFFFFFFFFFFFFFFFFFFFFFFFFFF
1540 DATA FFC3CF9F3F9FCF3F9FFFF83F8F8F
FFFFFC7F9FCFF3C7F7C3F8111F1E3E7FFE77519
1550 DATA FFB3C7C7C7C7C7C7C7C7C7C7C7C7
7C7FB1E3C7BF190FFB39F9F9F9FB34618
1560 DATA FFB3111183111183FF8311118111
103FFFE7E7FFFFFFFFFFFFFFFFFFFFFFFFFFFF
1570 DATA FFB1C7C7C7C7C7C7C7111111111B3C7
103FF1111111938BC7C7C7C7C7C7C7C7C7C7C7
1580 DATA FF11C1C7C7C7111FF111111B3C7C
7C7FB1E3C7BF190FFB39F9F9F9FB34618
1590 DATA FFC3BFBFBFBFBFBFCF9F9F9F9F
9C1FFE7C3B1E7E7E7E7FBFBFBFBFBFBFBFBF
1600 DATA FFFFFFFFFFFFFFFFFFFFFFFFFFFF
FEFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
1610 DATA FFB3B13939398183FFC7B7B7C7C7
783FF831F1831F1101FF8311F1183221B
1620 DATA FFC3CF9F9F9FCF3F9FFFF83F8F8F
FFFFFC7F9FCFF3C7F7C3F8111F1E3E7FFE77519
1630 DATA FFFFFFFFFFFFFFFFFFFFFFFFFFFF
FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
1640 DATA FFB3B13939398183FFC7B7B7C7C7
783FF831F1831F1101FF8311F1183221B
1650 DATA FFC3CF9F9F9FCF3F9FFFF83F8F8F
FFFFFC7F9FCFF3C7F7C3F8111F1E3E7FFE77519
1660 DATA FFFFFFFFFFFFFFFFFFFFFFFFFFFF
FEBE9BDFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
1670 DATA F3F5F1DFFFFFFFFFFFFFFFFFFFFF
CF4FCF2FCF4FCF4FEA6DDFFFEF4E4E4FC4C1E
1680 DATA FBFADFFDF4FCF4FCEC2F4FBDFFFEF
EFEF7E7E7E7E7E7E7E7E7E7E7E7E7E7E7E1E6
1690 DATA 7E7E7E7E7F7E7E7E7E7E7E7E7E7E
7E7E7E7E7E7E7E7E7E7E7E7E7E7E7E7E7E7E7E
1700 DATA 7B7B7B7B7B7B7B7B7B7B7B7B7B7B
7B7B7B7B7B7B7B7B7B7B7B7B7B7B7B7B7B7B7B
1710 DATA 7B7B7B7B7B7B7B7B7B7B7B7B7B7B
7B7B7B7B7B7B7B7B7B7B7B7B7B7B7B7B7B7B7B
1720 DATA 7B7B7B7B7B7B7B7B7B7B7B7B7B7B
7B7B7B7B7B7B7B7B7B7B7B7B7B7B7B7B7B7B7B
1730 DATA 7A7A7A7A7A7A7A7A7A7A7A7A7A7A
7A7A7A7A7A7A7A7A7A7A7A7A7A7A7A7A7A7A7A
1740 DATA 7A7A7A7A7A7A7A7A7A7A7A7A7A7A
7A7A7A7A7A7A7A7A7A7A7A7A7A7A7A7A7A7A7A
1750 DATA 8B0FDF7BDFDFDFDFDFDFDFDFDFDF
7C7B8F0B0DDFDFDFDFDFDFDFDFDFDFDFDFDFDF
1760 DATA DFDFDF7C7B0CBE0A9B0DFDFDFDFD
FDFDFDFDFDFDFDFDFDFDFDFDFDFDFDFDFDFDF
1770 DATA 7BDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7B9A9B0DFDFDFDFDFDFDFDFDFDFDFDFDFDF
AD0BA9A0B7BDFDFDFDFDFDFDFDFDFDFDFDFDF
1780 DATA 7C7B8B0DFDFDFDFDFDFDFDFDFDFD
FDFDFDFDFDFDFDFDFDFDFDFDFDFDFDFDFDFDF
1790 DATA 7BDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7B8B1A0DA0B1CDFDFDFDFDFDFDFDFDFDFDF
1800 DATA 9A0DFDFDFDFDFDFDFDFDFDFDFDFD
FDFDFDFDFDFDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7B8B1AFAABDFDFDFDFDFDFDFDFDFDFDFDFD
1810 DATA BDFDFDFDFDFDFDFDFDFDFDFDFDFD
FDFDFDFDFDFDFDFDFDFDFDFDFDFDFDFDFDFDF
1820 DATA 7BDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7B9A9B0DFDFDFDFDFDFDFDFDFDFDFDFDFDF
DBAB1A8DDFDFDFDFDFDFDFDFDFDFDFDFDFDFD
1830 DATA 7BDFDFDFDFDFDFDFDFDFDFDFDFDF
FDFDFDFDFDFDFDFDFDFDFDFDFDFDFDFDFDFDF
1840 DATA 7BDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7B8B3AACDFDFDFDFDFDFDFDFDFDFDFDFDFD
1850 DATA FDFDFDFDFDFDFDFDFDFDFDFDFDFD
FDFDFDFDFDFDFDFDFDFDFDFDFDFDFDFDFDFDF
1860 DATA 7BDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7B8B3ADDFDFDFDFDFDFDFDFDFDFDFDFDFDF
1870 DATA 7BDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7BDADAB1DFDFDFDFDFDFDFDFDFDFDFDFDFD
1880 DATA 7BDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7BB0B0A9B0DFDFDFDFDFDFDFDFDFDFDFDFD
1890 DATA 7BDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7BDBAC0A9B0DFDFDFDFDFDFDFDFDFDFDFDF
1900 DATA 7BDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7BDAAC0B0DFDFDFDFDFDFDFDFDFDFDFDFDF
1910 DATA 7BDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7BDAAC0A9B0DFDFDFDFDFDFDFDFDFDFDFDF
1920 DATA 7BDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7BDAAC0B0DFDFDFDFDFDFDFDFDFDFDFDFDF
1930 DATA 7BDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7BDAAC0A9B0DFDFDFDFDFDFDFDFDFDFDFDF
1940 DATA 7BDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7BDAAC0B0DFDFDFDFDFDFDFDFDFDFDFDFDF
1950 DATA 9FDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7B8B0DFDFDFDFDFDFDFDFDFDFDFDFDFDFDF
1960 DATA 7BDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7B8B0DFDFDFDFDFDFDFDFDFDFDFDFDFDFDF
1970 DATA 7BDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7B8B0DFDFDFDFDFDFDFDFDFDFDFDFDFDFDF
1980 DATA 7BDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7B8B0DFDFDFDFDFDFDFDFDFDFDFDFDFDFDF
1990 DATA 7BDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7B8B0DFDFDFDFDFDFDFDFDFDFDFDFDFDFDF
2000 DATA 7BDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7B8B0DFDFDFDFDFDFDFDFDFDFDFDFDFDFDF
2010 DATA E3F5FDFDFDFDFDFDFDFDFDFDFDFD
FDFDFDFDFDFDFDFDFDFDFDFDFDFDFDFDFDFDF
2020 DATA FBF6DDFDFDFDFDFDFDFDFDFDFDFD
EFEF7E7E7E7E7E7E7E7E7E7E7E7E7E7E7E1E6
2030 DATA 7E7E7E7E7E7E7E7E7E7E7E7E7E7E
7E7E7E7E7E7E7E7E7E7E7E7E7E7E7E7E7E7E7E
2040 DATA 7B7B7B7B7B7B7B7B7B7B7B7B7B7B
7B7B7B7B7B7B7B7B7B7B7B7B7B7B7B7B7B7B7B
2050 DATA 7A7A7A7A7A7A7A7A7A7A7A7A7A7A
7A7A7A7A7A7A7A7A7A7A7A7A7A7A7A7A7A7A7A
2060 DATA 7A7A7A7A7A7A7A7A7A7A7A7A7A7A
7A7A7A7A7A7A7A7A7A7A7A7A7A7A7A7A7A7A7A
2070 DATA 7B7B7B7B7B7B7B7B7B7B7B7B7B7B
7B7B7B7B7B7B7B7B7B7B7B7B7B7B7B7B7B7B7B
2080 DATA DFDFDFDFDFDFDFDFDFDFDFDFDFDF
DFDFDFDFDFDFDFDFDFDFDFDFDFDFDFDFDFDFDF
2090 DATA 7BDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7B9A9B7BDFDFDFDFDFDFDFDFDFDFDFDFDFD
2100 DATA 7BDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7B9A9B0DFDFDFDFDFDFDFDFDFDFDFDFDFDF
2110 DATA 7BDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7B9A9B0DFDFDFDFDFDFDFDFDFDFDFDFDFDF
2120 DATA DFDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7B9A9B7BDFDFDFDFDFDFDFDFDFDFDFDFDFD
2130 DATA DFDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7B8B0BDFDFDFDFDFDFDFDFDFDFDFDFDFDFD
2140 DATA DFDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7B0ACBDFDFDFDFDFDFDFDFDFDFDFDFDFDFD
2150 DATA DFDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7B8B0BDFDFDFDFDFDFDFDFDFDFDFDFDFDFD
2160 DATA DFDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7B8B0BDFDFDFDFDFDFDFDFDFDFDFDFDFDFD
2170 DATA DFDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7B8B0BDFDFDFDFDFDFDFDFDFDFDFDFDFDFD
2180 DATA DFDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7B8B0BDFDFDFDFDFDFDFDFDFDFDFDFDFDFD
2190 DATA DFDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7B8B0BDFDFDFDFDFDFDFDFDFDFDFDFDFDFD
2200 DATA DFDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7B8B0BDFDFDFDFDFDFDFDFDFDFDFDFDFDFD
2210 DATA DFDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7B8B0BDFDFDFDFDFDFDFDFDFDFDFDFDFDFD
2220 DATA DFDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7B8B0BDFDFDFDFDFDFDFDFDFDFDFDFDFDFD
2230 DATA DFDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7B8B0BDFDFDFDFDFDFDFDFDFDFDFDFDFDFD
2240 DATA DFDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7B8B0BDFDFDFDFDFDFDFDFDFDFDFDFDFDFD
2250 DATA 7B8B0A1ABDFDFDFDFDFDFDFDFDFD
2260 DATA DFDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7B8B0ACDFDFDFDFDFDFDFDFDFDFDFDFDFDF
2270 DATA DFDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7B8B0ACDFDFDFDFDFDFDFDFDFDFDFDFDFDF
2280 DATA DFDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7B8B0ACDFDFDFDFDFDFDFDFDFDFDFDFDFDF
2290 DATA 7C7B8B0ACDFDFDFDFDFDFDFDFDFD
2300 DATA DFDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7B8B0ACDFDFDFDFDFDFDFDFDFDFDFDFDFDF
2310 DATA 7C7B8B0ACDFDFDFDFDFDFDFDFDFD
2320 DATA DFDFDFDFDFDFDFDFDFDFDFDFDFDF
7C7B8B0ACDFDFDFDFDFDFDFDFDFDFDFDFDFDF
2330 DATA 7C7B8B0ACDFDFDFDFDFDFDFDFDFD
2340 DATA 0222C99F9020202020202020FFEEF
FFEFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
2350 DATA E1B141A141A101A161B1F1F1B141B1D
141701B1E1B1E1B141B141C2B5B0B6929997988F
7360 DATA 6108C5B0B5909B4999B4949141C0B
B2B2B9B4959219B7B0B9B9B9999190909F13AF
2370 DATA 51B121B141B101B151B141B101B10
```

in the new keyword press Return and the cursor will change back to black showing that the new keywords has been stored. If you press Return with an empty 'cell' then the contents are unchanged and the original keyword is displayed.

Pressing F7 brings you into a menu with the following options:

1. SAVE TO TAPE
2. LOAD FROM TAPE
3. SAVE TO DISC
4. LOAD FROM DISC
5. EDIT
6. BACK TO EDITOR

The first four options allow you to save and load complete sets of re-defined keywords on tape and disc. Each option requires you to type in the filename. For tape operations the filename may be empty. Pressing 6 will return you to the editor.

Pressing 5 will allow you to exit from the program and use your new commands or list programs in your modified Basic. However, because of the way the Commodore 64's Basic interpreter works you cannot use more than 256 characters in total in your new keywords. If you have used more than this, the program will tell you by how many characters you exceed this total.

When using your new Basic you can abbreviate the commands in the usual way. For example if you have a command called Display, simply type in D shift I.

Switching between ordinary Commodore Basic and your new Basic is very easy.

To switch to ordinary Basic:

POKE 700, 1

To switch to your new Basic:

POKE 700, 0

Remember to use your new version of the Poke command if you have changed it. The program is available on tape at £3.50. Write to Damian McComb, 23 Woodlawn Drive, Dungannon, BT70 1AJ.

Seconds out for the challenge of the season, guess this month's mystery Microgamer and you too could win a super prize!

'Knoc
ever

"My two top contenders"

1. Scooby Doo
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In the red corner we have Scooby Doo – a real heavyweight when it comes to catching criminals, ghosts and other things that go bump in the night.

2. Super Sleuth
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And in the blue corner another Super Sleuth. Which one will come out tops? Hard to say, Harry, but both are champs in my book.

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Spectrum 48K **£4.95**

GRUMPY GUMPHREY SUPERSLEUTH

by Gremlin Graphics
Keep your eye on the clock and look sharp! All your best moves have to be executed on time or you're in big trouble. Catch the shop thieves and above all keep the Manager happy – my motto exactly!
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MINI OFFICE

by Database
Comprising word processor – for writing letters and reports, a database – for storing addresses, and a spreadsheet – for storing complicated numbers. Pretty high-powered stuff, don't you think?
BBC **£5.95**

MAD DOCTOR

by Creative Sparks
As Mad Doctor, in this blood-curdlingly evil game, the player must create new life out of freshly killed body parts. If he arouses the villagers' suspicions, they'll kill him. A light touch on the scalpel is required.
Commodore 64 **£8.95**

kout games for fans where'

MARSPORT

by Gargoyle Games
Box your way out of this one! The World needs a Champion (what about me?) Yes, but *you* can be the champ here. That is if you sneak the defence plans from the doomed city and reinforce the force sphere. Not easy, with aliens attacking your every move.
Spectrum 48K and Amstrad **£9.95**

DYNAMITE DAN

by Mirrorsoft
Count to ten and concentrate. You think you can win on points? Well I tell you this game will have you reeling! He may not be a Jumbo or a Bonecrusher, but one thing is certain, Dynamite Dan is hard to beat.
Spectrum 48K **£6.95**
Amstrad and Commodore 64 **£8.95**

"Games to keep you on your toes".

RED ARROWS

by Database
These guys can sure move. But their game is a non-contact sport, if you get my drift. You can try your hand at formation flying, looping the loop and all the other tricks. Duck, dive, dodge, swerve and break – only don't hit anyone here.
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by Creative Sparks
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SCOOBY DOO

by Elite
Slippery customers throw in the towel when this ace detective is around. With your help he can track down and solve the mystery that haunts his friends. Join the elite band and pit your wits against the spooks.
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Commodore 64 **£7.95**
Amstrad **£8.95**

SPARKLERS SPECIAL

by Sparklers
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Commodore 64 **£7.95**
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All games featured above are available from Laskys, WH Smith and other good software stores.

Win

Spot this month's mystery microgamer and win a fantastic prize. Ten 2-pack program prizes must be won plus single game prizes for the first 100 runners up.

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I say the Mystery Microgamer is:

_____

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Machine_____

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Send to: THORN EMI Computer Software Mystery Microgamer Competition, Thomson House, 296 Farnborough Road, Farnborough, Hants GU14 7NU

Last month's Mystery Microgamer was Ian McCaskill. Prizes are on their way.

Prizewinners
Andrew James, Swansea
Bobby Earl, Birkenhead
Mark Johnson, Knottingley
Stephen Hirst, Castleford
Barry Cheeseman, Swindon
Graham Langlands, Dundee
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FIRST BYTES

BLUFFERS' GUIDE TO MICROS

Starting out in home computing? First Bytes is for you. Just write to *Your Computer* with any hardware or software problems, no matter how small or simple.

A favourite phrase with which experts love to bluff the sucker is "historical reasons". Read on, and learn what to say when such bullies kick bytes in your face.

When I played with government computers, there was an interesting hierarchy. At the top came the almost godlike Cray supercomputer, fed by a lowly IBM 370, running an operating system designed to imitate something 10 years out of date, and up at the sharp end in my office there was an electromechanical teletype.

Clatter, clatter. Deciphering the manuals, I discovered that what I wanted to do required one punched card at the start of my Fortran program. (Yes, they used punched cards. And we edited them by sticking bits of foil over unwanted holes. Men were men in those days.) Or, for *historical reasons,* I could pick the handy alternative of substituting 17 different cards for that single one. Lucky me!

Compatibility was the idea. Somewhere in this research establishment were thick, cobwebbed decks of cards, three operating systems old, which couldn't be let go out of date — so the new system was taught to read the old cards. If historical reasons were the same in education as in computers, we'd all have to cope with English, Latin and Anglo-Saxon . . .

History brought us the Qwerty layout: once supposedly devised to slow typists to the pace of clumsy machines, it seems established forever. Early computer terminals tended to have plain typewriter keyboards with a very few special keys like Control and Escape: the effects are still entrenched in software.

For example, in days before arrow keys, the writers of programs like WordStar wanted to let people move a cursor round the screen. They used Control plus letter keys. Anyone accustomed to typing without staring at the keyboard would have thought that, obviously, you'd press Control and U to move up, Control and L to go left, and so on. The programmers, though, were apparently one-finger typists, and picked the E, S, D and X keys, presumably because they were bunched together and easy to find by eye. Just remember that E stands for Up and D for Right . . .

Now everyone has arrow keys. But word-processors get bad reviews unles they also support the old, not particularly logical key combinations — because reviewers grew up with WordStar and like its keyboard for (ahem) historical reasons. We've likewise grown up with a ridiculously American-slanted 7-bit Ascii character set: each new British computer offers an exciting challnege, as you try to work out where they've put the pound sign.

To be purged with pity and terror, look at the MS-DOS Edlin and MicroSoft Basic line editors. You can't use the arrow keys at all. You can't alter anything which has appeared on the screen: instead, editing is done by a devious process of copying characters from a "template" line. Slowly the truth dawns. On what sort of clattering display is there no way to change a once-printed line . . .? Historical reasons strike again: although they've somehow invaded microcomputers, these editors were written for use with teletypes.

The backward-looking trend continues with Apricot's "Xen", a super-fast machine which can be specially downgraded to run slothful IBM software. Will IBM compatibility be a curse on new computers, unto the fifth generation?

Santayana said "those who cannot remember the past are condemned to repeat it" — but I remember it all too well and *still* have to repeat it, every time a program insists on my hitting Control-G instead of the perfectly good Delete key . . .

Dave Langford

I COULD DO THAT

As the climax to our competition series — arcade classic re-written in Basic — this month we are asking for a version of Pacman. Once again, the rule is make it short: no more than 20 Basic program lines. You may have to make do with only one ghost and a reduced board layout.

The winner of October's competition, S. Cartwright, 21 Maelog Place, Gabalfas, Cardiff CF4 3ED, shows here how to approach the task.

```
  1 LET SCORE=0  REM SPACE INVA  =A$[ TO 31]  LET B$=B$[32]+B$[ T
DERLUSE -KEYS.CAPS SHIFT-FIRE.  O 33]  GO TO 140
N-LEFT.H-RIGHT.BY S.CARTWRIGHT  102 LET A$=A$[2 TO 32]+A$[1]  L
CPA DEL                         ET B$=B$[2 TO 32]+B$[1]
  2 GO SUB 1000                 320 IF A$[32]=" " THEN LET DIR=
 100 IF FIRE=0 THEN BORDER 0, IF  0  PRINT AT HEIGHT-1;"
IN 65278=190 THEN LET FIRE=1  L                    LET HEI
ET HIS=BASEX-5                  GHT=HEIGHT+1, GO TO 340
 150 IF HIS=0 THEN PRINT AT HIS  340 IF UP=0 THEN LET M$=A$  LET
 ;"  ";X$;"  " LET HIS=X40  LET  DIR=2
INE=0                           345 LET M$=B$                  UP=0
 155 IF FIRE=1 THEN PRINT AT HIS  345 LET M$=B$                 LET
 ;"  ";X$;"  " LET HIS=X40  LET  360 PRINT AT HEIGHT;0;M$
ET HIS=HIS+INE-1  IF HIS>=HEIGHT+1  500 IF HEIGHT=1 THEN GO TO 300
 THEN IF A$[HIS+1]=" " THEN LET  600 PRINT AT 10,11, FLASH 1;"GA
 A$[HIS+1]=" "  LET B$[HIS+1]=" "  ME OVER", BEEP 1,-10, BEEP 2,-24
 180 LET BLP=IN 32766, IF BLP[10  LET M$=" "
T NUM1=NUM1+1  LET SCORE=SCORE+1  1000 LET NUM1=10  LET FIRE=0  LE
0 PRINT AT 0,28;SCORE  IF NU  T UP=0  LET DIR=0  LET BASEX=13
M1=0 THEN GO TO 1                   LET HIS=20  LET HEIGHT=0  LET H
 200 LET BLP=IN 32766, IF BLP[10  DS=1 THN  LET M$=" "
0 THEN IF BLP[10 THEN LET BASEX  H H H H H H H                LET BSA=
=BASEX+BLP-200                   U U U U U U U U U U U U U U U U
 261 LET BASEX=BASEX-(BASEX>28)+  LET M$=M$  INK 7  PAPER 0  BOR
(BASEX>0)  PRINT AT 21;BASEX;CH  DER 0,  PRINT 21;AT 0,28;SCO
 280 IF DIR=1 THEN LET A$=A$[32]  CORE  RETURN  REM INITIALISE
```

THE LANGAUGE OF "C"

"C is a general-purpose programming language which features economy of expression, modern control flow and data structures, and a rich set of operators. C is not a 'very high level' language, nor a 'big' one, and is not specialised to any particular area of application. But its absence or restrictions and its generality make it more convenient and effective for many tasks than supposedly more powerful languages.

C was originally designed for and implemented on the UNIX operating system on the DEC PDP-11, by Dennis Ritchie. The operating system, the C compiler, and essentially all UNIX applications programs are written in C.

It's hard to think of a better summary of C than this paragraphs of the famous Kernighan and Ritchie book.

Above all C is a practical language — designed by programmers to be used by programmers for writing real programs. And it doesn't matter what kind of program.

(continued on next page)

THE LANGUAGE OF "C"

(continued from previous page)

It's not a language where you struggle to express your thoughts — like assembler or old Basic with no control flow; or modern Basic, Forth, Prolog, Logo, Fortran with no data structures. Nor is it a language which hems you in with theories like Pascal or Ada.

C has a reputation for speed which rests on two things. First, it is a compiled language — one where programs are translated into machine code by a compiler before being run. This makes C programs much faster than those run by an interpreter, where each line in the program is translated into machine code over and over again as the program runs.

Secondly, the facilities of the C language were designed to match the abilities of real computers — so that efficient pieces of machine code can be generated for each line in the program. This is in contrast with some languages which are waiting for new types of computer to run them efficiently.

C can be used to write many different kinds of programs in a very natural way. The chief key is the flexibility of C's data structures. It is simple to write out the data blocks needed to control a graphics chip, a sound envelope, or a disc file-control-block; then the program that uses them just follows on.

As well as the expressive power built-in to C, more power flows from the vast range of library functions available. These are functions — or subroutines — which do useful jobs and can be used freely in your own programs. For example there is a function "qsort" which sorts data into order: it's very flexible and can be used to sort many different kinds of data at the drop of a hat. There are typically well over a hundred such functions supplied with a compiler.

C has come a long way from its origins on UNIX and is now very widely available. HiSoft sell a C compiler on a wide range of home micros — the Spectrum, all the Amstrad models including the new PCW8256, MSX disc models, the Tatung Einstein, and many other computers running the CP/M operating system. There are a multitude of compilers available for the IBM PC and MSDOS computers, and almost every mini and mainframe has a C compiler.

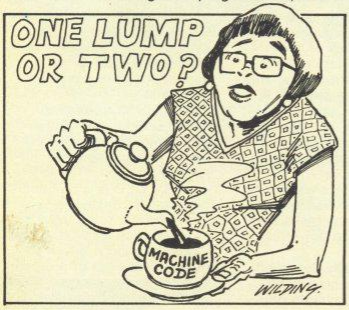
It is usually quick and easy to move a program from one to another, although differences do exist. For this reason business programs, and even operating systems, are now often written in C rather than machine code itself. The key here is UNIX which provides an effective standard to compare versions.

Hisoft can be found at 180 High Street North, Dunstable, Beds (telephone (0582) 696421) and will be pleased to help you with questions about C. The Kernighan and Ritchie book is entitled *The C Programming Language* and published by Prentice-Hall (ISBN 0-13-110163-3): it should whet your appetite for C further, though there are lots of other good books to choose from.

Dave Howarth

MACHINE CODE

In an interview with an American computer magazine Bill Atkinson, the author of the Macintosh's drawing program, MacDraw, was at pains to point out that he had written the entire program in "hand-crafted code". In other words, he had written it in machine code. This pride may come as a surprise to commercial games programmers, who have been writing hand-crafted code all along.



Thew point of Bill Atkinson's remark, however, was that nowadays a program that has been written entirely in machine code, using an assembler, is something of a rarity. Operating systems and business application programs are increasingly written in a high level language such as C and then compiled. Even in 1981, when the BBC operating system was being developed, most of it was programmed in BCPL.

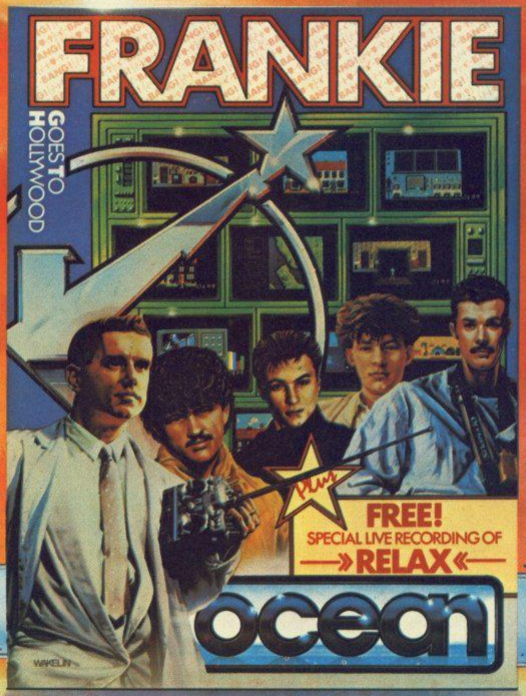
As memory prices fall, processors speed up, and compilers become more efficient, it makes more and more sense to develop software in this way. Unless a piece of code has to be particularly compact or fast, there is no need to write it in assembler. It takes longer to write and is less easy to convert for other machines.

But for home computer owners the situation is slightly different. There are several good reasons why you should at least pick up a smattering of machine code. For one thing, it will give you a much better understanding of the way your machine works. It will also allow you to access those parts of the computer that Basic cannot reach. Interrupt-driven routines, for example, can only be implemented in machine code.

More important, though, is the fact that machine code is much faster than Basic. Take, for example, the problem of moving or animating shapes on screen. It is easy enough in Basic to move a character across the screen a character space at a time. But for smooth animation shapes need to be shifted only one or two pixels at a time. For this Basic is just too slow.

The speed advantages of machine code are very substantial indeed.

TAKE A TRIP INTO THE PLEASUREGAME



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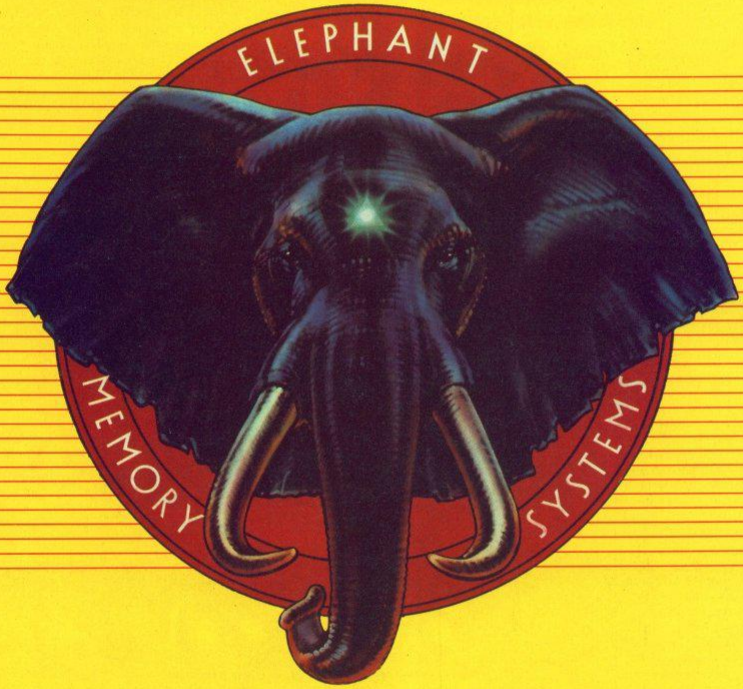

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Competition results

CBM-128

Anyone who has ever spent much time hooked on one game is bound to consider ways in which the game could be improved. So it is not surprising that our August competition tapped a rich vein of suggestions, along with critical analyses and outbursts of frustration. The prize was a CBM-128. To be in the running you had to send in an idea for a new screen, room, or feature in your favourite game.

The most common and dullest idea was that the combatants in Way of the Exploding Fist should be equipped with weapons. Others were more imaginative and came up with such improvements as a welly throwing event for Decathlon, an option to do a dirty foul in International Soccer and be sent off, an asteroid belt for Elite, and — from S. Barron — the inspired idea of rewriting Hunchback in the style of Ant Attack.

Best of all, we thought, was the detailed proposal for a sado-therapeutic dwarf bashing location in the adventure game Knights Quest. This wins Neil Thraves, 153A, Fullwell Ave., Barkingside, Ilford, Essex, the prize. In his entry he explained that he was maddened by being repetively told, first, "A dwarf is with you" and then — after an attempt to kill the blighter: "he dodges your blows easily and laughs". He supplied a sample text from the new location. It included such exchanges as:

SWING DWARF

The dwarf swings to and fro, trailing small sparks from his blazing beard and waving his stubby little arms.

CUT ROPE WITH SWORD

The dwarf plunges headfirst into the stone floor, and then begins to sing feebly about gold.

We also asked you to name your Top Ten commercial games.

The full results in the form of a list of the all-time top 50 games will be given in *Your Computer*'s Top 100, to be published separately in December. For the time being see table 1 for the top 10, as computed from nearly 9,000 nominations:

Table 1.

1.	Way of the Exploding Fist	Melbourne House
2	Knightlore	Ultimate
3	Ghostbusters	Activision
4	Elite	Acornsoft/Firebird
5	Hobbit	Melbourne House
6	Impossible Mission	US Gold
7	Daley Thompson's Decathlon	Ocean
8	Raid over Moscow	US Gold
9	Dambusters	US Gold
10	Pitstop 2	CBS

AMSTRAD 6128

"Put yourself in the place of someone writing a book entitled '1001 uses of a disc drive'. Now dream up an entry for it". So ran our intro to September's Amstrad 6128 competition.

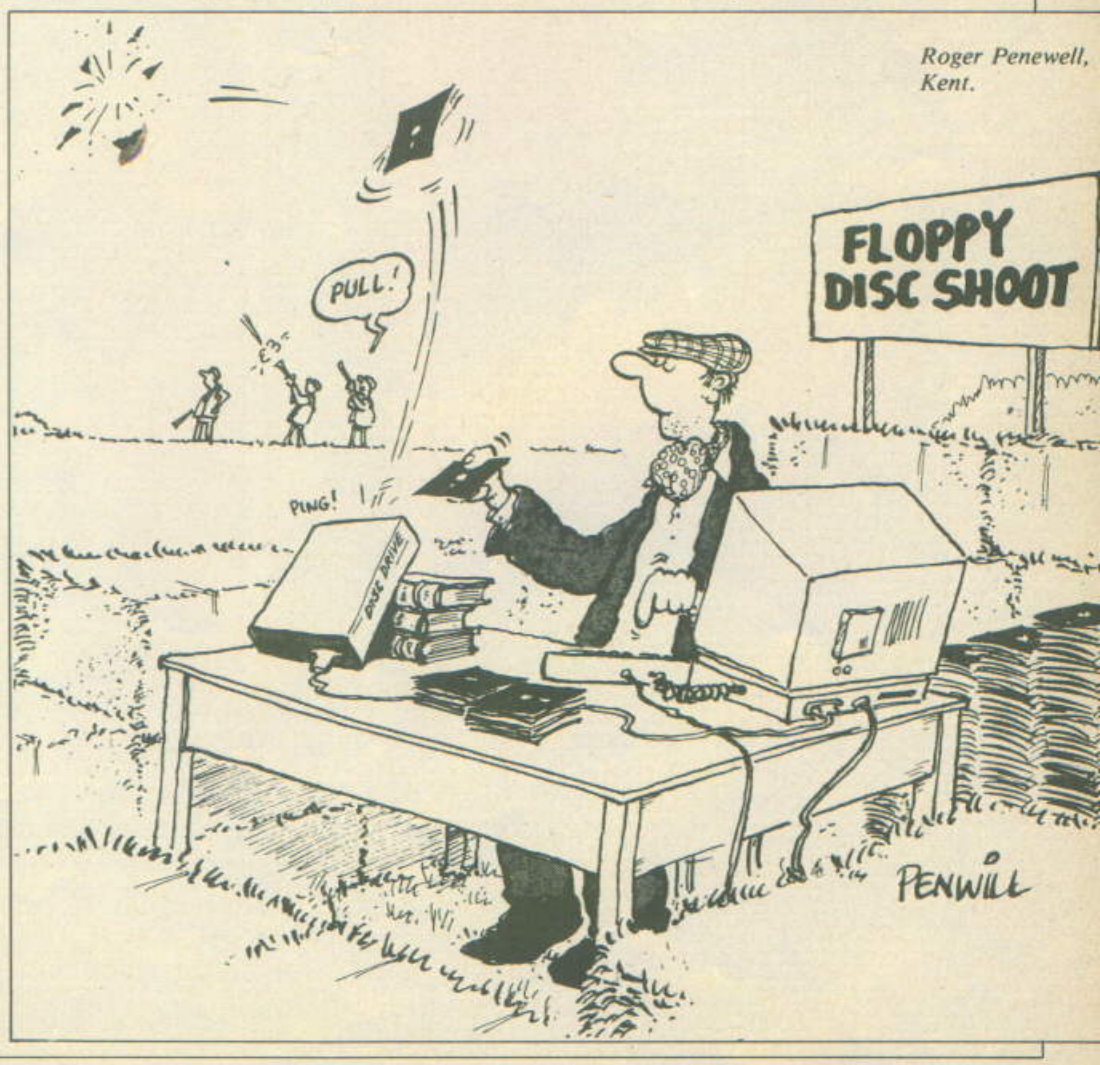
In response you sent in a number of highly sensible and constructive suggestions together with...a lot of very silly ones. Many of the latter were in the same vein as the recent story about the secretary who made back-up copies of her wordprocessing files by photocopying her discs. Since had been told that the drive ran double-sided discs she took care to photocopy both sides.

A fair number of the entries seemed preoccupied with food. Along with suggestions for using a drive as a toaster we received outlines for a Disc Drive Pizza Machine, the Bisk Drive, totally compatible with lemon curd and smooth peanut butter, and a recipe for making Ramcakes, either 40 or 80 tracks.

Other ideas included J. Higgo's explanation of how to convert a drive into a Spectrum coolant fan, and G. Pearce's Abrazor disc. With its abrasive razor surface, the Abrazor ensures that "application of beard area systematically to drive aperture activates simultaneous chin-scan and de-whisker operation".

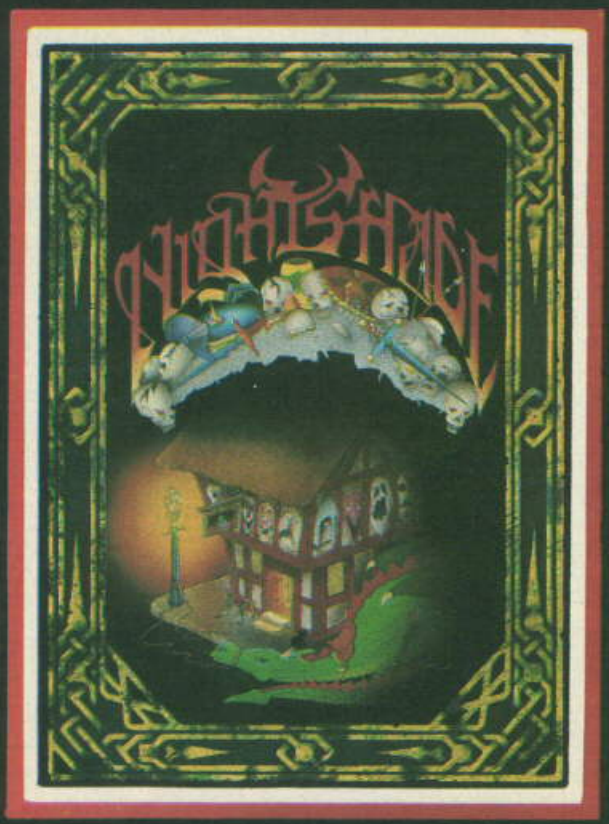
Several other entries hit on an even more novel application: clay disc shooting. The best of these was neatly illustrated by Roger Penwill, 127 Penenden, New Ash Green, Kent DA3 8LT and wins him the Amstrad 6128.

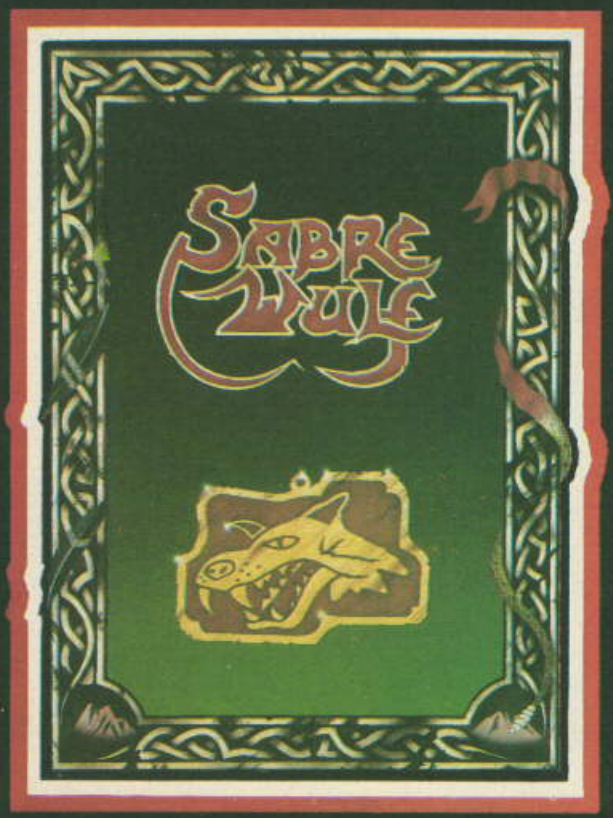
September's Philips monitor and Mud competitions will be judged next month.

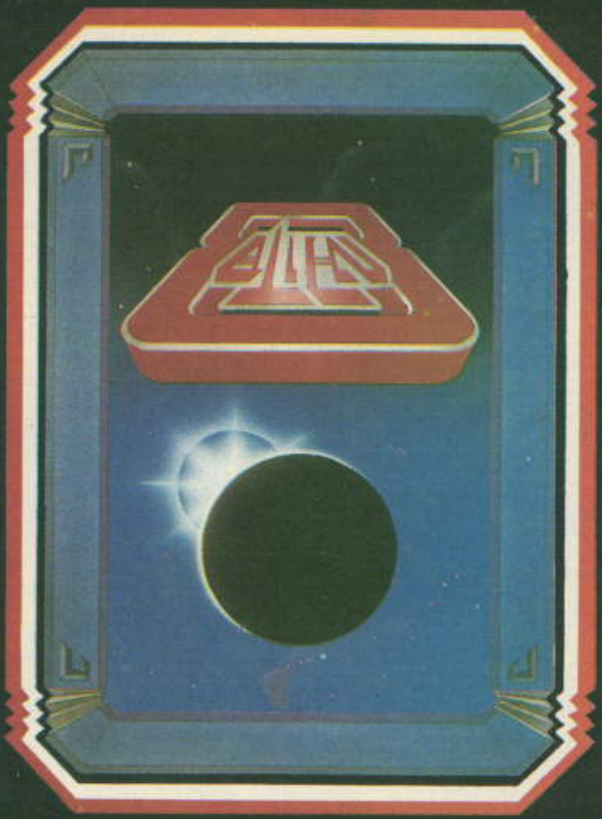


Roger Penewell, Kent.

AMSTRAD CPC 464







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ULTIMATE
PLAY THE GAME

Do you have a problem related to your micro? Our team will do their best to help. Please include only one question per letter and mark it "Response Frame". Alternatively, perhaps you have an idea you have an idea you'd like to pass on to others. Why not write to us with your top tips?

COMMODORE 64 OR AMSTRAD?

● I am thinking of buying my first micro but I can't decide between CBM-64 and Amstrad CPC-464.
Ali Imran,
Lahore,
Pakistan.

One of the main factors to consider before choosing between either machine is that they are both being superceded by superior machines built by the same manufacturers. Because of the relentless competition between manufacturers, in a few months time it should be possible to buy both the CBM-64 and the Amstrad CPC-464 at very much reduced prices.

Access to more computing power

Both the BBC and the Amstrad give access to more computing power because of their superior Basic programming languages and graphics capabilities. However, the CBM-64 should not be over-looked as a first machine especially for the purpose you mention. The 64 has a huge software base and is capable of some fairly impressive feats.

What you must decide between, therefore, is the Commodore's impressive software support and the Amstrad's convenience with its built-in cassette unit and monitor.

But remember, both Commodore and Amstrad are releasing new, more powerful machines at prices similar to their predecessors.
Irwan Owen.

DETECTING A SPECIFIC CHARACTER

● Could you please tell me if there is a way on the Commodore 64 of detecting the specific character involved in a sprite-to-data collision e.g. in a game of Blitz, the blitz plane is a sprite, the buildings are redefined characters, and there are stars scattered above the buildings, which themselves are redefined characters. How can you tell if the sprite plane is colliding with the buildings and not the stars?
Martin Wicks,
Southampton,
Hampshire.

Unfortunately, the CBM-64 does not have a built in method for determining which screen characters a sprite has collided with.

The simple solution to your problem would be to print all the stars above the top of the line of buildings. It would then be a case of interpreting the Y-position of the sprite to decide what it must have collided with.

A more complicated approach is to convert the standard hires coordinates the sprite into character positions. This is done as follows taking into account the X and Y offsets at the edge of the screen.

x_char = INT((x – 24)/8)
y_char = INT((y – 50)/8)

These give x and y values of 1-24 and 1-40 respectively. These values can then be used in conjunction with a look-up table in the machines memory to find the address of the character square in the top left corner of the sprite. The contents of this address can then be accessed and identified.
Irwan Owen.

INSTANTANEOUS SCREENS

● Could you explain to me how I should go about making screens appear instantaneouly in machine code and also how to work it so as a loading screen can be made to appear after loading Basic.
Hadyn Seak,
Finsbury Park,
London

A quick way to make a screen is to load it higher up in the memory than usual and then dump it to screen via an ldia routine.

For example,
CLEAR 49150:LOAD""CODE 49151

then poke these values into any part of the memory.

33,0,229	LD HL,SOURCE
17,0,64	LD DE, DESTINATION
1,0,27	LD BC,NO OF BYLTES (6912)
237,176	LDIR
201	RET

RANDOMIZE USR (START OF ROUTINE)

The only thing about this is that it takes the same time to load, although more spectacular, and if you intend to write a game using full screens you'll waste previous memory.

By making a loading screen appear from Basic I assume you mean as in the case of Chuckie Egg and Wheelie, where the screen is hidden in the Basic.

The best way, I find, to do this is to tack an ldir routine on the front of a screen and count the number of bytes (should be 6924). Next set up a Rem statement and put in the same amount of spaces (understand?).

For example:
10 REM . . . etc
then make the next line as follows:
20 FOR N = 23755 TO XXXXX: PRINT N,PEEK N: NEXT N.
(Where XXXXX = any high number).

As soon as you spot a "32" code number then write the address down. Delete line 20 and load the ldir/screen into that address. Hopefully it will appear if you make lines 20/30 as follows:
20 BORDER X: INK X: PAPER X: RANDOMIZE USR START ADDRESS.
30 . . . Continue with program.

A slightly more efficient way to do it is to get yourself a screen compressor program and load your screen into it. The compressed program that emerges will be self contained and you can load it back to any part of the memory you wish, including the basic. A quick Rand USR et voila!
Craig Rawston.

TOP TIPS

With this program for the BBC or Electron you can display letters at any angle on the screen either slightly smaller than normal or up to ten times larger. The prgram starts by asking for the word you wish to print, followed by the new size and angle.

L. Edmond.

```
10 MODE1:INPUT "WORD";WO$
20 INPUT"SIZE (0.68-10)";SI
30 INPUT"ANGLE (-8 TO 8)";DE
35 CLS:PRINTTAB(0,0),WO$
40 IN=32*LEN(WO$)
45 Q=(1279-IN*SI)/2
50 PROCtiler:END
60 DEFPROCtiler
70 FOR H=1 TO IN STEP 4
80 ANG=ANG+DE
90 FOR G=994 TO 1023 STEP 4
100 X=H*SI+Q:Y=G*SI+ANG-SI*1000
+300
105 GCOL0,2
110 IF POINT(H,G)<>0 GCOL0,2:DR
AW X,Y:ELSE GCOL0,0:MOVE X,Y
120 NEXT G,H:ENDPROC
```

HISOFT

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Devpac	14.00	21.95	19.95	39.95	19.95
C	25.00	34.95		*	(MON QL)
Ultrakit	9.45				
Font64/MSX		7.95	9.95	(Font designer)	
The Knife		12.95	(CP/M disc editor)		
The Torch		12.95	(CP/M disc Tutorial)		
The Colt	12.95	(Fast integer BASIC compiler)			

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Software File

PRO SYNTH

▶*Andrew Parker ● CBM-64 ● Warrington, Cheshire*

This program allows you to use the keyboard as a sort of musical instrument. The keyboard is from Z to / and from Q to *. This gives a span of three octaves. Sharps are S,D,G,H,J,L,;,2,3,4,6,7,9,0,+.

When the program is running, a sprite "hand" is visible. This is moved by a joystick in port 2. Placing the finger on the hand over a plus or minus sign causes the connected value to change by +1 or −1 repsectively. This works with the Envelope and Pulse Width Resolution (PWR). With the Oscillator 3 frequency, pressing the fire button allows the function keys to alter the frequency. This is because the frequency can be between 0 and 65535 Hz.

Programs for Software File should be fairly compact and sent on a cassette. Please include clear instructions and say what computer it's for. We pay between £6 and £36 for programs published. They must be double-checked and submitted to *Your Computer* exclusively.

Therefore, the function keys either add (+) or subtract (−) the following values:

F1 = +/−1 F3=+/−10 F= +/− 100 F7 = +/− 1000 (Hz)

This allows rapid changes of the frequency. When the required frequency is set, pressing Inst/Del returns to the keyboard. This frequency only applies when ring modulation or synchronization is working.

Waveforms are selected by placing the finger on the required waveform and pressing the button. Reversed characters shown correct selection. Ring modulation and synchronization (RM and SY) are selected in the same way. To turn off, repeat the process. Note that if one is selected while the other is still on, it will be turned off.

Oscillator control shows which voices are working, either voice one voice or both.

ADSR: Attack, Decay, Sustain, Release. The four parts of a standard envelope generator. The note rises to a peak, decays to a sustain level, then dies way.

MODULATION: Application of a control voltage, for example a low frequency oscillator (LFO) to control an element in the shaping of a sound. In other words, the use of one control to influence or alter the effects of another.

RING MODULATION: As MODULATION, producing an output equal to the sum and difference of the two input frequencies. Produces some bell sounds.

SYNCHRONIZATION: Combining two notes without altering their pitch.

Listing 1.

```
5 DIMNO(70,2):PRINTCHR$(14)
10 POKE53280,6:POKE53281,0
70 FORDE=1TO4000:NEXT
150 PRINT"{CLR}  {SH E}NVELOPE":PRINT"{PUR}   {C=A}{SH
*}{C=R}{SH *}{C=R}{SH *}{C=R}{SH *}{C=S}"
160 PRINT"{HOME}{DOWN}":FORL=1TO16:PRINT"{PUR}   {C=Q}
{SH +} {SH +} {SH +}  {C=W}":NEXT .
170 PRINT"{HOME}{DOWN}{DOWN}15{DOWN}{DOWN}{DOWN}{DOWN}
{DOWN}{LEFT}{LEFT}10{DOWN}{DOWN}{DOWN}{DOWN}{DOWN}{LEF
T}5{DOWN}{DOWN}{DOWN}{DOWN}{DOWN}{LEFT}0"
180 PRINT"  {SH -}{SH A}{SH -}{SH D}{SH -}{SH S}{SH -}
{SH R}{SH -}"
190 PRINT"  {C=Q}{SH *}{SH +}{SH *}{SH +}{SH *}{SH +}{
SH *}{C=W}{DOWN}{LEFT}{LEFT}{LEFT}{LEFT}{LEFT}{LEFT}{L
EFT}{LEFT}{LEFT}{SH -}+{SH -}+{SH -}+{SH -}+{SH -}{DOW
N}{LEFT}{LEFT}{LEFT}{LEFT}{LEFT}{LEFT}{LEFT}{LEFT}{LEF
T}{C=Q}{SH *}{SH +}{SH *}{SH +}{SH *}{SH +}{SH *}{C=W}
"
195 PRINT"{DOWN}{LEFT}{LEFT}{LEFT}{LEFT}{LEFT}{LEFT}{L
EFT}{LEFT}{LEFT}{SH -}-{SH -}-{SH -}-{SH -}-{SH -}{DOW
N}{LEFT}{LEFT}{LEFT}{LEFT}{LEFT}{LEFT}{LEFT}{LEFT}{LEF
T}{C=Z}{SH *}{C=E}{SH *}{C=E}{SH *}{C=E}{SH *}{C=X}"
200 PRINT"{HOME}"SPC(12)"{SH W}AVEFORM {SH C}ONTROL
{SH P}{SH W}{SH R}   "
210 PRINTSPC(35)"{GRN}{C=A}{SH *}{C=S}"
215 PRINTSPC(12)"{GRN}{C=A}{SH *}{SH *}{C=R}{SH *}{SH
*}{C=R}{SH *}{SH *}{C=R}{SH *}{SH *}{C=S}   {C=A}{SH *
}{SH *}{SH *}{SH *}{SH *}{C=R}{C=W}+{SH -}"
220 PRINTSPC(12)"{GRN}{SH -}{WHT}{SH T}R{GRN}{SH -}{YE
L}{SH S}A{GRN}{SH -}{CYN}{SH P}U{GRN}{SH -}{PUR}{SH N}
O{GRN}{SH -}   {SH -}     %{SH -}{C=Q}{SH *}{C=W}"
225 PRINTSPC(12)"{GRN}{C=Z}{SH *}{SH *}{SH *}{C=E}{SH *}{SH
*}{C=E}{C=R}{C=R}{C=E}{SH *}{SH *}{C=X}   {C=Z}{SH *}{
SH *}{C=R}{C=R}{SH *}{C=E}{C=W}-{SH -}"
230 PRINTSPC(12)"{GRN}          {SH -}{C=Z}{SH *}{SH *}{S
H *}{SH *}{SH *}{SH *}{SH *}{SH *}{SH *}{C=X}{SH
-}  {C=Z}{SH *}{C=X}"
235 PRINTSPC(12)"{GRN}          {C=Z}{SH *}{SH *}{SH *}{S
H *}{SH *}{SH *}{SH *}{SH *}{SH *}{SH *}{SH *}{SH *}{C
=X}"
240 PRINT"{HOME}{DOWN}{DOWN}{DOWN}{DOWN}{DOWN}{DOWN}{D
OWN}{DOWN}{DOWN}"SPC(12)" {SH C}ONTROL    {SH O}SC.3 {
SH F}REQ"
250 PRINTSPC(12)" {YEL}{C=A}{SH *}{SH *}{C=R}{SH *}{SH
*}{C=S}   {C=A}{SH *}{SH *}{SH *}{SH *}{SH *}{SH *}{S
H *}{SH *}{SH *}{C=R}{C=R}{SH *}{C=S}"
255 PRINTSPC(12)" {YEL}{SH -}{WHT}{SH R}{SH M}{YEL}{SH
-}{GRN}{SH S}{SH Y}{YEL}{SH -}   {SH -}        {SH H}Z
{SH -}{SH -}+{SH -}"
260 PRINTSPC(12)" {YEL}{C=Z}{SH *}{C=R}{C=E}{C=R}{SH *
}{C=X}   {C=Z}{SH *}{SH *}{SH *}{C=R}{SH *}{C=R}{SH *}
{SH *}{SH *}{C=E}{SH +}{SH *}{C=W}"
265 PRINTSPC(12)"{YEL}   {SH -}  {C=Z}{SH *}{SH *}{SH *
}{SH *}{SH *}{SH *}{SH *}{SH *}{C=X}  {SH -}    {
SH -}-{SH -}"
270 PRINTSPC(12)"{YEL}   {C=Z}{SH *}{SH *}{SH *}{SH *}
{SH *}{SH *}{SH *}{SH *}{SH *}{SH *}{SH *}{SH *}{SH *}
{C=X}     {C=Z}{SH *}{C=X}"
280 PRINT:PRINT:PRINT
290 PRINTSPC(12)"{SH O}SCILLATOR {SH C}ONTROL"
295 PRINTSPC(12)"{PUR}   {C=A}{SH *}{SH *}{SH *}{C=R}{
SH *}{SH *}{SH *}{C=S}"
300 PRINTSPC(12)"{PUR}   {SH -}{WHT}{SH O}NE{PUR}{SH -
}{YEL}{SH T}WO{PUR}{SH -}"
305 PRINTSPC(12)"{PUR}   {C=Z}{SH *}{SH *}{SH *}{C=E}{
SH *}{SH *}{SH *}{C=X}"
400 DATA3,0,0,7,128,0,3,192,224,1,225,224,0,241,192,0,
121,192,0,127,192,3,255
405 DATA192,7,255,192,7,207,192,1,243,192,15,253,224,1
5,254,224,15,159,216
410 DATA1,239,184,7,247,112,7,254,224,7,253,192,0,11,1
28,0,7,0,0,0,0
415 POKE2040,13
420 FORL=0TO62:READA:POKE832+L,A:NEXT
430 V1=53248:V2=54272
440 POKEV1+21,1:POKEV1+39,1
500 DATA12,4,48,23,4,180,20,5,71,31,5,152,28,6,71,39,7
,12,36,7,233,47,8,97
505 DATA44,9,104,55,10,143,62,11,48,9,12,143,14,14,24,
17,15,210,22,16,195,25
510 DATA18,209,30,21,31,33,22,96,38,25,30,41,28,49,46,
31,165,49,33,135,13,4,112
520 DATA11,14,239,19,17,195,24,19,239,32,23,181,35,26,
156,40,29,223,42,8,225
525 DATA18,4,251,59,11,218,8,13,78,26,5,237,29,6,167,3
4,7,119,45,9,247,-1,-1,-1
530 READA,B,C
535 IFA=-1ANDB=-1ANDC=-1THEN600
540 NO(A,1)=B:NO(A,2)=C:GOTO530
600 S=54272:POKES+24,15
610 X=152:Y=214
620 AT=10:DE=B:SU=10:RE=9
```

(continued on next page)

File

(continued from previous page)

```
630 WA$="P":SY=0:RM=0:PW=50:OF=30000:HF=116:LF=255:S1=
1:S2=0
690 D$="{DOWN}{DOWN}{DOWN}{DOWN}{DOWN}{DOWN}{DOWN}{DOW
N}{DOWN}{DOWN}{DOWN}{DOWN}{DOWN}{DOWN}{DOWN}{DOW
N}{DOWN}{DOWN}{DOWN}{DOWN}"
700 PA=17-AT:PD=17-DE:PS=17-SU:PR=17-RE
710 PRINT"{HOME}{RIGHT}{RIGHT}{RIGHT}";LEFT$(D$,PA)"{W
HT}{SH *}";PRINT"{HOME}{RIGHT}{RIGHT}{RIGHT}{RIGHT}{RI
GHT}";LEFT$(D$,PD)"{WHT}{SH *}"
720 PRINT"{HOME}{RIGHT}{RIGHT}{RIGHT}{RIGHT}{RIGHT}{RI
GHT}{RIGHT}";LEFT$(D$,PS)"{WHT}{SH *}";PRINT"{HOME}{RI
GHT}{RIGHT}{RIGHT}{RIGHT}{RIGHT}{RIGHT}{RIGHT}{RIGHT}{
RIGHT}";LEFT$(D$,PR)"{WHT}{SH *}"
725 PRINT"{HOME}{DOWN}{DOWN}{DOWN}"SPC(12)"{GRN}{SH -}
{WHT}{SH T}R{GRN}{SH -}{YEL}{SH S}A{GRN}{SH -}{CYN}{SH
P}U{GRN}{SH -}{PUR}{SH N}O{GRN}{SH -}"
730 IFWA$="T"THENPRINT"{HOME}{DOWN}{DOWN}{DOWN}"SPC(13
)"{RVS}{WHT}{SH T}R{OFF}":WA=17+4*(ABS(RM=1))+2*(ABS(S
Y=1))
735 IFWA$="S"THENPRINT"{HOME}{DOWN}{DOWN}{DOWN}"SPC(16
)"{RVS}{YEL}{SH S}A{OFF}":WA=33+4*(ABS(RM=1))+2*(ABS(S
Y=1))
740 IFWA$="P"THENPRINT"{HOME}{DOWN}{DOWN}{DOWN}"SPC(19
)"{RVS}{CYN}{SH P}U{OFF}":WA=65+4*(ABS(RM=1))+2*(ABS(S
Y=1))
745 IFWA$="N"THENPRINT"{HOME}{DOWN}{DOWN}{DOWN}"SPC(22
)"{RVS}{PUR}{SH N}O{OFF}":WA=129+4*(ABS(RM=1))+2*(ABS(
SY=1))
760 IFRM=1THENPRINT"{HOME}":LEFT$(D$,11)SPC(14)"{RVS}{
WHT}{SH R}{SH M}{OFF}"
765 IFRM=0THENPRINT"{HOME}":LEFT$(D$,11)SPC(14)"{WHT}{
SH R}{SH M}"
770 IFSY=1THENPRINT"{HOME}":LEFT$(D$,11)SPC(17)"{RVS}{
GRN}{SH S}{SH Y}{OFF}"
775 IFSY=0THENPRINT"{HOME}":LEFT$(D$,11)SPC(17)"{GRN}{
SH S}{SH Y}"
785 IFS1=1THENPRINT"{HOME}"LEFT$(D$,20)SPC(16)"{RVS}{W
HT}{SH O}NE{OFF}"
790 IFS1=0THENPRINT"{HOME}"LEFT$(D$,20)SPC(16)"{WHT}{S
H O}NE"
795 IFS2=1THENPRINT"{HOME}"LEFT$(D$,20)SPC(20)"{RVS}{Y
EL}{SH T}WO{OFF}"
800 IFS2=0THENPRINT"{HOME}"LEFT$(D$,20)SPC(20)"{YEL}{S
H T}WO"
820 GOSUB2000:GOSUB3000:GOSUB3100
825 POKEV2+14,F1:POKEV2+15,F2
830 POKEV1+16,HX:POKEV1,LX:POKEV1+1,HY
835 POKEV1+14,LF:POKEV1+15,HF
900 AD=16*AT+DE:SR=16*SU+RE
905 BI=PW*40.95
910 IFBI<255THENPL=BI:GOTO920
915 PL=255:PH=(BI-PL)/256
930 POKEV2+2,PL:POKEV2+3,PH:POKEV2+5,AD:POKEV2+6,SR
940 IFS2=0THEN1000
950 POKEV2+9,PL:POKEV2+10,PH:POKEV2+12,AD:POKEV2+13,SR
1000 KE=PEEK(197):J=PEEK(56320)
1003 POKEV2+14,LF:POKEV2+15,HF
1005 IFJ<>127THEN4000
1010 IFNO(KE,1)=0THEN1000
1020 POKEV2+1,NO(KE,1):POKEV2,NO(KE,2)
1025 IFS2=0THEN1040
1030 POKEV2+8,NO(KE,1):POKEV2+7,NO(KE,2)
1040 IFS1=1THENPOKEV2+4,WA
1045 IFS2=1THENPOKEV2+11,WA
1050 WAIT197,64
1060 POKEV2+4,WA-1:POKEV2+11,WA-1
1070 GOTO1000
2000 L=PEEK(56320)
2010 IFL=119ANDX<311THENX=X+8
2020 IFL=126ANDY>8THENY=Y-8
2030 IFL=123ANDX>8THENX=X-8
2040 IFL=125ANDY<247THENY=Y+8
2050 HX=INT(X/256):LX=X-(256*HX):HY=Y
2060 RETURN
3000 IFPW<10THENA1=31
3005 IFPW<100THENA1=30
3010 IFPW=100THENA1=29
3020 L$=STR$(PW)
3030 PRINT"{HOME}{DOWN}{DOWN}{DOWN}"SPC(29)"    "
3035 PRINT"{HOME}{DOWN}{DOWN}{DOWN}{WHT}"SPC(A1)L$
3040 RETURN
3100 IFOF<10THENA2=28
3105 IFOF>9THENA2=27
3110 IFOF>99THENA2=26
3115 IFOF>999THENA2=25
3120 IFOF>9999THENA2=24
3130 PRINT"{HOME}{DOWN}{DOWN}{DOWN}{DOWN}{DOWN}{DOWN}{
DOWN}{DOWN}{DOWN}{DOWN}{DOWN}"SPC(26)"    "
3135 PRINT"{HOME}{DOWN}{DOWN}{DOWN}{DOWN}{DOWN}{DOWN}{
DOWN}{DOWN}{DOWN}{DOWN}{DOWN}{WHT}";SPC(A2)STR$(OF)
3140 RETURN
4000 POKE198,0:L=PEEK(56320)
4005 IFL=111THEN5000
4010 IFL=119ANDX<311THENX=X+8
4020 IFL=126ANDY>8THENY=Y-8
4030 IFL=123ANDX>8THENX=X-8
4040 IFL=125ANDY<247THENY=Y+8
4050 HX=INT(X/256):LX=X-(256*HX):HY=Y
4060 POKEV1+16,HX:POKEV1,LX:POKEV1+1,HY
4070 GOTO950
5000 REM * HAND ROUTINES *
5005 IFHY>208ANDLX<100ANDHX=0THEN5200
5010 IFHY>208THEN5300
5020 IFHY>136ANDHY<146ANDHX=0THEN5400
5025 IFHY>72ANDHY<82ANDLX<210THEN5500
5030 IFHY>64ANDHY<90ANDLX>50THEN5600
5035 IFHY>136ANDHY<162ANDLX>43ANDLX<51ANDHX=1THEN5700
5200 REM ** ADSR **
5205 IFHY>208ANDHY<218THEN5215
5210 IFHY>224ANDHY<234THEN5255
5212 GOTO760
5215 IFAT=15THEN5225
5220 IFLX>42ANDLX<50THENPRINT"{HOME}"SPC(3)LEFT$(D$,17
-AT)" {UP}{LEFT}{WHT}{SH *}";AT=AT+1
5225 IFDE=15THEN5235
5230 IFLX>56ANDLX<66THENPRINT"{HOME}"SPC(5)LEFT$(D$,17
-DE)" {UP}{LEFT}{WHT}{SH *}";DE=DE+1
5235 IFSU=15THEN5245
5240 IFLX>72ANDLX<82THENPRINT"{HOME}"SPC(7)LEFT$(D$,17
-SU)" {UP}{LEFT}{WHT}{SH *}";SU=SU+1
5245 IFRE=15THEN5255
5250 IFLX>88ANDLX<98THENPRINT"{HOME}"SPC(9)LEFT$(D$,17
-RE)" {UP}{LEFT}{WHT}{SH *}";RE=RE+1
5253 GOTO700
5255 IFAT=0THEN5265
5260 IFLX>42ANDLX<50THENPRINT"{HOME}"SPC(3)LEFT$(D$,17
-AT)" {DOWN}{LEFT}{WHT}{SH *}";AT=AT-1
5265 IFDE=0THEN5275
5270 IFLX>56ANDLX<66THENPRINT"{HOME}"SPC(5)LEFT$(D$,17
-DE)" {DOWN}{LEFT}{WHT}{SH *}";DE=DE-1
5275 IFSU=0THEN5285
5280 IFLX>70ANDLX<86THENPRINT"{HOME}"SPC(7)LEFT$(D$,17
-SU)" {DOWN}{LEFT}{WHT}{SH *}";SU=SU-1
5285 IFRE=0THEN5295
5290 IFLX>88ANDLX<98THENPRINT"{HOME}"SPC(9)LEFT$(D$,17
-RE)" {DOWN}{LEFT}{WHT}{SH *}";RE=RE-1
5295 GOTO760
5300 REM ** VOICES **
5305 IFLX>146ANDLX<170THEN5360
5310 IFLX>202THEN700
5313 IFS2=0THENS2=1:GOTO700
5320 IFS2=1THENS2=0:GOTO700
5360 IFS1=1THENS1=0:GOTO700
5370 IFS1=0THENS1=1:GOTO700
5400 REM ** RM AND SY **
5405 IFLX>152ANDLX<170THEN5430
5410 IFLX>130ANDLX<146THEN5420
5415 GOTO700
5420 IFRM=1THENRM=0:GOTO5440
5425 IFRM=0THENRM=1:SY=0:GOTO5440
5430 IFSY=1THENSY=0:GOTO5440
5435 IFSY=0THENSY=1:RM=0
5440 IFWA$="T"ANDRM=1THENWA=21
5443 IFWA$="T"ANDSY=1THENWA=19
5445 IFWA$="S"ANDRM=1THENWA=37
5448 IFWA$="S"ANDSY=1THENWA=35
5450 IFWA$="P"ANDRM=1THENWA=69
5453 IFWA$="P"ANDSY=1THENWA=67
5455 IFWA$="N"ANDRM=1THENWA=133
5458 IFWA$="N"ANDSY=1THENWA=131
5460 IFWA$="T"ANDRM=0ANDSY=0THENWA=17
5465 IFWA$="S"ANDRM=0ANDSY=0THENWA=33
5470 IFWA$="P"ANDRM=0ANDSY=0THENWA=65
5475 IFWA$="N"ANDRM=0ANDSY=0THENWA=129
5480 GOTO760
5500 REM ** WAVEFORMS **
5510 IFHY>72ANDHY<82THEN5520
5515 GOTO700
5520 IFLX>122ANDLX<136THENWA=17:RM=0:SY=0:WA$="T"
5525 IFLX>146ANDLX<162THENWA=33:RM=0:SY=0:WA$="S"
5535 IFLX>170ANDLX<186THENWA=65:RM=0:SY=0:WA$="P"
5545 IFLX>194ANDLX<210THENWA=129:RM=0:SY=0:WA$="N"
5550 GOTO700
5600 REM ** PWR **
5610 IFLX>50ANDLX<60THEN5620
5615 GOTO700
5620 IFHY>64ANDHY<74ANDPW<100THENPW=PW+1
```

(continued from page 116)

```
5625 IFHY>80ANDHY<90ANDPW>0THENPW=PW-1
5630 GOSUB3000
5650 IFPEEK(56320)=111THEN5620
5660 GOTO700
5700 REM ** OSC.3 FREQ **
5710 IFHY>152ANDHY<162THEN5800
5715 IFHY>136ANDHY<146THEN5725
5720 GOTO700
5725 K1=PEEK(197)
5730 IFK1=4ANDOF<65534THENOF=OF+1
5735 IFK1=5ANDOF<65524THENOF=OF+10
5740 IFK1=6ANDOF<65434THENOF=OF+100
5745 IFK1=3ANDOF<64534THENOF=OF+1000
5750 IFK1=0THEN5800
5755 GOSUB3100
5760 GOTO5725
5800 K1=PEEK(197)
5805 IFK1=4ANDOF>1THENOF=OF-1
5810 IFK1=5ANDOF>10THENOF=OF-10
5815 IFK1=6ANDOF>100THENOF=OF-100
5820 IFK1=3ANDOF>1000THENOF=OF-1000
5830 IFK1=0THEN5900
5835 GOSUB3100
5840 GOTO5800
5900 IFOF>255THEN5950
5905 LF=OF:HF=0:GOTO700
5950 LF=255:IM=OF-255:HF=IM/256
5955 GOTO760
```

ULTRALIST

▶*Mark Franklin ● Spectrum ● 69 The Heights, Northolt, Middlesex*

This program allows you to produce decent looking listings on an RS-232 printer, connected to the Interface I. It indents the lines so that the only things which can be seen in the left hand column are the line numbers. It also prints up page numbers for printers using single sheets of paper, and allows any number of characters per row. It lets you list out a particular range of line numbers from a program, so that there is no need to waste paper printing unwanted lines.

To enter the program, run the machine code loader given. Once you get the message "DATA OK", the loader gives you a chance to customise it to the size of your own printer. Once this is done save it to microdrive using the command:- SAVE*"m";1;"ULTRALIST"CODE 64000,1000

The program requires four parameters in a special order. However, if only two are given, the other two will be given an assumed value. Similarly, if none are given, all four will be assumed. They are specified in a Rem statement in line 9999.

The order they are given is: Start line No, finish line no, start page no, listing width-5. They should be written with spaces between them. The last one, listing width, is the number of characters printed per line, and can be adjusted to allow room for comments on the right hand side. If this is not specified, it willbe set to the printer width value. The start page number is included so that individual pages can be printed, if only a small alterration is made to what that page previously read.

One the parameters have been entered, type RANDOMISE USR 64000

It will now begin printing. When it reaches the bottom of the sheet of paper, the boarder will go red. This is a signal that you casn set up the next sheet of paper and press any key to resume the listing.

If, at any time you wish to abort the listing, press the "A" key until the border goes blue. It will now finish printing the current line.

The program was written with the Brother EP-22 printer in mind. The pound symbol code on this printer is different to that of the Spectrum. If your printer is not like this, then POKE 64557,0 and POKE 64558,0.

Also, all graphics are printed as "?". I have included a demo program and a listing which if produced itself show the main features.

To change the operating BAUD rating, initially set at 300 Bd. Type in the following instructions:-
FORMAT "t"; Baud rate.
POKE 64212, PEEK 23747
POKE 64213, PEEK 23748

I will be pleased to answer any inquiries about the program if an SAE is sent to Mark Franklin, 69 The Heights, Northolt, Middlesex, UB5 4BP. I can also supply a ready made copy on tape for £2.00 and on Microdrive for £3.50.

Listing 1.

```
10 PAPER 0: INK 7: BRIGHT 1: BORDER 0: CLS
15 PRINT AT 0,11; INK 5;"ULTRALIST"
30 PRINT ' INK 6;"Example of parameters"
40 PRINT '" Start line      10"
50 PRINT "  Finish line  1033"
60 PRINT "  Page no.      34"
70 PRINT "  Page width    50"
100 PRINT ''''   9999 REM 10 1033 34 50"
1000 FOR f=USR "a" TO USR "e"-1: READ a: POK
E f,a: NEXT f
1010 DATA 16,40,40,69,69,130,130,130,130,128
,128,128,0,0,0,64,160,160,16,16,8,43,72;
72,72,106,72,72,64,64,64
1020 PRINT AT 18,25;" ";TAB 25;"
1030 RANDOMIZE USR 64000
9999 REM 10 1033 34 50
```

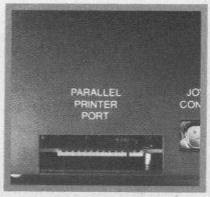
Listing 2.

```
  0>REM
1985,  Mark Franklin
10 CLEAR 63999
15 POKE 23692,255
20 FOR f=64000 TO 64991 STEP 16
25 LET c=0
30 FOR g=f TO f+15
40 READ a
45 IF a>500 THEN  GO TO 200
50 LET c=c+a
60 POKE g,a
70 NEXT g
80 READ a
90 IF c<>a THEN  GO TO 200
95 PRINT (f-64000)/16*10+1000;"
OK"
100 NEXT f
110 PRINT ' FLASH 1;"DATA   OK"
130 INPUT "Enter no. of rows per li
ne on   your printer....";i
140 POKE 64167,1-4: POKE 64775,1-5
150 INPUT "Enter no. of rows to be
printed per page.....";r
160 POKE 64442,r
190 STOP
200 PRINT  FLASH 1;"ERROR AT ";(f-6
4000)/16*10+1000: STOP
1000 DATA 237,91,123,92,33,190,253,3
4,123,92,33,114,253,6,76,126,1876
1010 DATA 35,215,16,251,237,83,123,9
2,42,75,92,43,43,126,254,13,1740
1020 DATA 32,250,35,126,254,39,40,9,
43,43,43,126,254,39,194,82,1609
1030 DATA 253,35,126,254,15,194,82,2
53,35,35,35,126,254,234,194,82,2207
1040 DATA 253,205,20,253,237,83,227,
253,56,33,205,20,253,237,83,229,2647
1050 DATA 253,56,43,205,20,253,123,5
0,226,253,56,48,205,20,253,123,2187
1060 DATA 50,224,253,126,254,13,40,5
0,195,82,253,205,223,252,11,17,2248
1070 DATA 14,39,237,83,229,253,205,0
,253,205,6,253,24,45,205,223,2274
1080 DATA 252,205,234,252,205,0,253,
205,6,253,24,31,205,223,252,205,2805
1090 DATA 234,252,205,12,253,205,6,2
53,24,17,205,223,252,205,234,252,283
2
1100 DATA 205,12,253,58,224,253,254,
71,210,82,253,55,63,205,84,253,2535
1110 DATA 229,42,229,253,34,227,253,
205,84,253,32,7,35,35,94,35,2047
1120 DATA 86,35,25,34,229,253,225,34
,227,253,175,50,225,253,103,111,2318
1130 DATA 34,222,253,33,190,1,34,195
,92,42,227,253,62,253,219,254,2364
1140 DATA 230,1,32,14,58,72,92,230,5
6,203,63,203,63,203,63,211,1794
1150 DATA 254,201,229,58,224,253,71,
5,5,197,62,32,207,30,193,16,2037
1160 DATA 248,62,80,207,30,62,97,207
,30,62,103,207,30,62,101,207,1795
1170 DATA 30,62,32,207,30,58,226,253
,79,6,0,205,248,251,62,13,1762
1180 DATA 207,30,225,62,0,50,222,253
,58,222,253,203,127,40,6,62,2020
1190 DATA 0,50,198,92,201,229,86,35,
94,35,205,231,251,62,32,229,2030
1200 DATA 207,30,225,94,35,86,213,62
,253,219,254,230,1,32,12,229,2182
1210 DATA 33,222,253,203,254,225,62,
1,50,198,92,35,34,231,253,126,2272
1220 DATA 254,58,40,6,254,203,40,2,2
4,7,229,33,222,253,203,206,2034
1230 DATA 225,254,96,202,45,252,254,
165,210,55,252,254,128,48,100,254,27
94
1240 DATA 32,210,47,252,254,13,40,11
,254,14,32,187,35,35,35,35,1486
1250 DATA 35,24,180,205,155,252,33,2
22,253,203,134,209,225,19,19,19,2187
1260 DATA 19,25,237,91,229,253,122,6
1,188,48,4,123,61,189,216,229,2095
1270 DATA 33,223,253,54,0,35,35,52,1
26,254,60,56,34,54,0,35,1304
```

(continued on page 121)

Opus

PERIPHERAL
THROUGH
CONNECTOR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(continued from page 117)

```
1280 DATA 52,62,2,211,254,175,219,25
4,230,31,254,31,40,247,58,72,2192
1290 DATA 92,230,56,203,63,203,63,20
3,63,211,254,225,195,220,250,225,275
6
1300 DATA 195,40,251,62,63,24,72,229
,235,1,24,252,205,7,252,1,1913
1310 DATA 156,255,205,7,252,229,193,
225,229,197,225,1,246,255,205,7,2887
1320 DATA 252,125,205,24,252,225,201
,175,9,60,56,252,237,66,61,40,2240
1330 DATA 12,229,33,222,253,203,198,
225,30,48,131,24,11,229,33,222,2103
1340 DATA 253,203,70,225,32,242,62,3
2,229,207,30,225,201,62,156,229,2458
1350 DATA 205,155,252,225,195,71,251
,229,245,214,165,17,149,0,205,65,264
3
1360 DATA 12,241,245,254,206,56,9,33
,222,253,203,78,32,61,24,12,1941
1370 DATA 254,202,48,55,254,199,48,4
,254,197,48,47,26,230,127,205,2198
1380 DATA 133,252,26,19,135,48,245,2
41,254,213,48,40,254,211,48,12,2179
1390 DATA 254,202,48,32,254,199,48,4
,254,168,48,24,33,222,253,203,2246
1400 DATA 142,225,195,71,251,213,205
,155,252,209,201,62,32,213,205,155,2
786
1410 DATA 252,209,24,200,62,32,205,1
55,252,24,225,207,30,33,223,253,2386
1420 DATA 126,35,60,190,32,35,35,52,
42,231,253,62,14,35,190,204,1596
1430 DATA 205,252,62,13,190,40,17,43
,190,40,13,35,207,30,6,5,1348
1440 DATA 197,62,32,207,30,193,16,24
8,175,50,223,253,201,35,35,35,1992
1450 DATA 35,35,35,201,55,63,229,197
,225,237,82,56,117,225,201,237,2230
1460 DATA 91,227,253,1,14,39,205,212
,252,201,237,75,229,253,237,91,2617
1470 DATA 227,253,205,212,252,237,91
,229,253,1,14,39,205,212,252,201,288
3
1480 DATA 62,1,50,226,253,201,62,70,
50,224,253,201,58,226,253,254,2444
1490 DATA 100,48,63,201,17,0,0,35,12
6,254,32,40,250,254,13,40,1473
1500 DATA 42,205,27,45,56,44,6,9,229
,213,225,25,16,253,209,26,1630
1510 DATA 213,214,48,95,22,0,25,235,
225,35,126,254,13,40,7,254,1806
1520 DATA 32,32,222,55,63,201,62,1,5
0,222,253,58,222,253,254,1,1981
1530 DATA 55,201,207,25,42,83,92,70,
35,78,35,94,35,86,35,229,1402
1540 DATA 42,227,253,237,66,225,56,5
,40,3,25,24,234,43,43,43,1566
1550 DATA 43,201,16,5,19,1,17,0,32,3
2,32,32,32,32,32,558
1560 DATA 32,32,32,85,76,84,82,65,76
,73,83,84,32,32,32,32,932
1570 DATA 32,32,32,32,32,32,16,5,144
,146,16,7,32,32,32,32,654
1580 DATA 32,32,32,127,32,32,77,97,1
14,107,32,70,114,97,110,107,1212
1590 DATA 108,105,110,32,32,32,32,32
,32,32,16,6,145,147,16,40,917
1600 DATA 40,69,69,130,130,130,130,1
28,128,128,128,0,0,0,64,160,1434
1610 DATA 160,16,16,8,43,72,72,72,10
6,72,72,64,64,64,0,0,901
```

SCREEN DUMP

▶*Nick Godwin ● Amstrad ● Eyemouth, Berwickshire*

Since I obtained a Brother M-10009 printer I have, of course, been plugging-in various routines to try and fully utilise its capabilities. However, because for some reason beyond my comprehension the Amstrad CPC-464 does not send bit 7 to the printer, some 50 per cent of the excellent printer characters are unavailable to me. In fact, I can't even get the printer's £-sign!

I therefore quickly became interested in the idea of a screen-dump, and have been plugging in every such program that I have been able to find. However, I was unable to find one that satisfied my needs, so I decided to knuckle down and write my own.

This screen dump is different from most in that it is designed for A4 size paper, somewhat wider than usual. Also, rather that dumping the whole screen, it dumps one line only, which is selected by sending a parameter — the line-number — to the machine-code. The whole screen can therebye be dumped from Basic, if required, or any line or set of lines that you may happen to require. The parameter can be either a constant or a variable.

In order to make up the additional width, I have arranged for the four horizontal bits that must be interpreted from the display to be translated into six bits to be set to the printer. In order to retain squareness, I matched this vertically, so that each printed character is in fact twelve bits high rather than the usual eight. This has resulted in a "chunky" look which I find rather nice. Line-drawings, such as circles and squares, are therefore true in shape.

The Basic Loader enables the machine code to be placed anywhere in Ram above Himen — space is reserved if necessary. The complete code and variables occupies 253 bytes. Provision is also made for printers with a minimum line-feed unit of 1/36", instead of the 1/72" that is available to me — in fact, the M-10009 has a minimum line-feed capability of 1/216", but I do not use that in this routine.

Because the printer has to make two passes for each line of print, the net printing speed is reduced accordingly, but this is more than compensated for by the additional graphics capability. In fact, anything that can be displayed on the screen can be copied to the printer. Note, however, that the graphics origin must be 0,0 before the machine code is called.

The machine code does not assume ink 0 to be the paper ink, but tests to see what ink the paper is set to. That is the only colour not printed — all other inks are dumped.

Listing 1.

```
10 DATA DD,6E,0,7D,FE,1A,D0,3E,1A,95,21,8,0,1,10,0,3D,28,3,9,18,FA,E
5,3E,1B,CD,x1,0,3E,40,CD,x1,0,3E,1B,CD,x1,0,3E,41,CD,x1,0,3E,6,CD,x1
,0,CD,x2,0,E1,1,8,0,A7,ED,42,CD,x2,0,3E,1B,CD,x1,0,3E,40,C3,x1,0,6,4
,3E,20,CD,x1,0,10,F9,3E,1B,CD,x1,0,3E,4C,CD,x1,0
20 DATA 3E,20,CD,x1,0,3E,3,CD,x1,0,1,80,2,11,0,0,C5,D5,E5,3E,0,32,x4
,0,3C,32,x3,0,6,4,C5,E5,D5,CD,99,BB,4F,C5,CD,F0,BB,C1,D1,E1,B9,23,23
,28,B,3A,x3,0,4F,3A,x4,0,81,32,x4,0,3A,x3,0,CB,27,32,x3,0,C1,10,D7,3
A,x4,0,E,0,FE,0,28,28,FE,F,20,4,E,3F,18,20,CB,47
30 DATA 28,4,CB,C1,CB,C9,CB,4F,28,4,CB,C9,CB,D1,CB,57,28,4,CB,D9,CB,
E1,CB,5F,28,4,CB,E1,CB,E9,79,32,x4,0,CD,x1,0,E1,D1,C1,CB,43,28,A,CB,
4B,28,6,3A,x4,0,CD,x1,0,13,B,78,B1,C2,x5,0,3E,A,CD,2E,BD,38,FB,C3,31
,BD,0,0
40 DATA xxx
50 CLS:PRINT"EPSON-TYPE SCREEN DUMP by Nick Godwin":PRINT:PRINT:INPU
T"Start address (max 43651)";address:IF address >43651 OR address=0
THEN address=43651
```

(continued on next page)

File

(continued from previous page)

```
60 PRINT:PRINT"Address =";address:MEMORY address-1:FOR j=address TO
address+252:READ a$:IF ASC(a$)=120 THEN GOSUB 130:GOTO 80
70 POKE j,VAL("&"+a$)
80 NEXT j
90 PRINT:PRINT"Select the minimum line feed quantity","available on
your EPSON COMPATIBLE","printer:":PRINT:PRINT"1 ... 1/72":PRINT:PRIN
T"2 ... 1/36":PRINT
100 INPUT a:IF a=2 THEN POKE (address+44),3
110 PRINT:PRINT"SCREEN DUMP is now loaded.":PRINT:PRINT"To operate:
CALL";address;"line":PRINT:PRINT'" is CTRL H
120 END
130 IF a$="x1" THEN a=address+243
140 IF a$="x2" THEN a=address+71
150 IF a$="x3" THEN a=address+252
160 IF a$="x4" THEN a=address+251
170 IF a$="x5" THEN a=address+106
180 POKE(j+1),INT(a/256):POKE j,(a-256*INT(PEEK(j+1))):j=j+1:READ a$
:RETURN
190 n=0
200 READ a$:IF a$="xxx" THEN END ELSE n=n+1:GOTO 200
```

SCROLLS

▶T A Bratley • Spectrum • Grimsby, South Humberside

Here is a set of eight versatile, easily used and interesting scroll routines which can be added to your Basic programs to clear all or part of a screen in one of 8 directions.

The routines scroll one character square at a time in the following compass directions.

N, S, E, W, NE, NEW, SE, SW.

The old character square is blanked out and its attribute is replaced with one of your choice.

The difference between these and previously published routines is that any section of the screen can be scrolled in any direction and leave any colour attribute behind. This includes the bottom two lines.

There are only five parameters you have to supply in order to define the section of the screen to be scrolled, and below are the addresses you need to poke for both 16K and 48K machines. (16 in brackets)

POKE 64000, (31232), h. (1 to 24)
POKE 64001, (31233), w. (1 to 32)
POKE 64002, (31234), r. (0 to 23)
POKE 64003, (31235), c. (0 to 31)
POKE 64004, (31236), a (attribute)

This defines a box of height h, width w, with a top left-hand corner at r,c (where r and c are the normal PRINT AT cordinates), to be replaced with a new attribute a.

Height and width most always be at least one because a box must have two dimensions, and care must be taken to see that the box does not exceed the screen limits.

The attribute is calculated in the usual way by multiplying the paper colour by eight and then adding the ink value. If bright is required add a further 64 to the total so far, and finally if Flash is required add a further 128.

After poking the values for machine code routines to use you will then have to select whichever scroll direction you require.

The table below gives you the addresses for both machines

DIRECTION	16K	48K
N	31241	64009
S	31253	64021
E	31265	64033
W	31277	64045
NE	31289	64057
SE	31303	64071
SW	31317	64085
NW	31331	64099

These routines use the values r,c (row, column) to calculate the actual memory address of the top left-hand corner of the box and its corresponding attribute address. They then take the width and height of the box and use the lower of these two valves as a loop counter within the machine code to repeatedly call the appropriate routines until the box is cleared. This saves using a For Next loop in Basic and therefore speeds up the scrolling. However, this has a slight disadvantage in that very small boxes are scrolled off so fast that the effect is lost.

Because the machine code is not relocatable I have given two decimal dumps for the for the 16K and 48K machine. The 16K version is entered at 31232 and the 48K version at 64000, and both are 654 bytes in length.

To enter the code use the decimal loader in Program 1. There is a checksum at the end to make sure no data entry errors have been made.

16K Checksum = 73333
48K Checksum = 83923

You can obtain a printout of the decimal dump by typing GOTO 1000, if an error has been made. If you have no printer change the LPrint statements to Print statements and check it on the screen. When you are sure everything is OK then save the code by typing;

16K SAVE "Scrolls' Code 31232, 654
48K SAVE "Scrolls" Code 64000, 654

To load the code CLEAR 31231 for a 16K or 63999 for a 48K, then Load "" ' code.

I have written a demonstration program which runs through all the routines with different size boxes to give you some idea of what the routines can do.

A good idea is to set up the parameters of the box first then load a Screen$ from a commercial game and finally run a routine to clear part of the screen. This gives you a very interesting effect, especially the diagonal scrolls.

(continued on page 125

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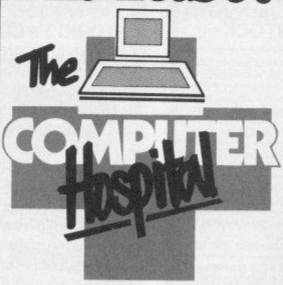

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Hex loader.

```
  10 DEF FN h(h$)=16*(CODE h$(1)
-48-(7 AND h$(1)>"9"))+CODE h$(2
)-48-(7 AND h$(2)>"9")
  19 REM hfdhd
  20 INPUT "Start ";s
  30 INPUT "Finish ";f
  39 REM fd
  40 FOR n=s TO f STEP 8
  50 LET tot=0: PRINT n;": ";
  60 INPUT h$: PRINT h$;
  70 LET x=0
  80 FOR b=1 TO LEN h$ STEP 2
  90 LET z=FN h(h$): LET tot=tot
+z
 100 POKE n+x,z
 110 LET h$=h$(3 TO ): LET x=x+1
 120 NEXT b
 130 PRINT " = ";: INPUT t: PRIN
T t
 140 IF tot<>t THEN  PRINT "inpu
t error - try again": GO TO 50
 150 NEXT n
 160 REM enter STOP to stop
```

Listing 1. 16K

```
31232: 1820000000000000 = 56
31240: 003A007A47C5CD7C = 777
31248: 7AC110F9C93A007A = 961
31256: 47C5CD897AC110F9 = 1190
31264: C93A017A47C5CD96 = 1005
31272: 7AC110F9C93A017A = 962
31280: 47C5CDA37AC110F9 = 1216
31288: C9CD717AC5CD7C7A = 1289
31296: CD967AC110F6C9CD = 1338
31304: 717AC5CD897ACD96 = 1251
31312: 7AC110F6C9CD717A = 1218
31320: C5CD897ACDA37AC1 = 1344
31328: 10F6C9CD717AC5CD = 1305
31336: 7C7ACDA37AC110F6 = 1191
31344: C93A007A473A017A = 633
31352: B8D047C9CDD47ACD = 1408
31360: B07ACD0F7CCD4F7B = 1049
31368: C9CDD97ACDB57ACD = 1458
31376: 437CCD797BC9CDD4 = 1258
31384: 7ACDB07ACDD77BCD = 1373
31392: 017BC9CDD47ACDB0 = 1245
31400: 7ACDA57BCD2C7BC9 = 1188
31408: 3A027A18093A007A = 395
31416: 3D4F3A027A8121 00 = 484
31424: 58A728074711 2000 = 422
31432: 1910FD3A037A856F = 721
31440: 22077AC93A027A18 = 570
31448: 093A007A3D4F3A02 = 389
31456: 7A81210040A72810 = 571
31464: 47112000197DFE20 = 556
31472: 30047CC607671 0F4 = 744
31480: 3A037A856F22057A = 588
31488: C92A077A2B3A017A = 596
31496: 5F1600193A007A47 = 393
31504: C5E5E5D12B06003A = 971
31512: 017A3D4FEDB8233A = 777
31520: 047A77E111200019 = 544
31528: C110E5C92A077A3A = 868
31536: 007A47C5E5E5D123 = 1092
31544: 06003A017A4F0DED = 516
31552: B02B3A047A77E111 = 764
31560: 200019C110E5C92A = 738
31568: 077A3A007A3D473A = 499
31576: 017AC5E511200019 = 623
31584: D1E506004FEDB0E1 = 1161
31592: C110EFE5D1133D4F = 1045
31600: 06003A047A77EDB0 = 722
31608: C92A077A3A007A3D = 613
31616: 473A017AC5E5A711 = 862
31624: 2000ED52D1E50600 = 795
31632: 4FEDB0E1C110EDE5 = 1392
31640: D1133D4F06003A04 = 436
31648: 7A77EDB0C92A057A = 1024
31656: 3A007A47C5E50608 = 691
31664: C5E5E5D123060003A = 963
31672: 017A3D4FEDB02BAF = 894
31680: 77E124C110EAE17D = 1173
31688: C6206FFE2030047C = 803
31696: C60867C110D6C92A = 975
31704: 057A3A017A3D856F = 613
31712: 3A007A47C5E50608 = 691
31720: C5E5E5D12B06003A = 971
31728: 017A3D4FEDB823AF = 894
31736: 77E124C110EAE17D = 1173
31744: C6206FFE2030047C = 803
31752: C60867C110D6C92A = 975
31760: 057A3A007A3D47C5 = 636
31768: EB627BC6206FFE20 = 1083
31776: 30047CC60867E506 = 720
31784: 08C5E5D506003A01 = 712
31792: 7A4FEDB0D1E11424 = 1104
31800: C110EEE1C110D8CD = 1302
31808: 777CC92A057A3A00 = 671
31816: 7A3D47C5EB627BD6 = 1121
31824: 206FFEE038047CD6 = 1019
31832: 0867E50608C5E5D5 = 993
31840: 06003A017A4FEDB0 = 679
31848: D1E11424C110EEE1 = 1162
31856: C110D8CD777CC906 = 1080
31864: 08C5E5E5D1133A01 = 950
31872: 7A3D4FAF4777EDB0 = 1040
31880: E124C110ECC900 = 907
```

Listing 2. 48K

```
64000: 1820000000000000 = 56
64008: 003A00FA47C5CD7C = 905
64016: FAC110F9C93A00FA = 1217
64024: 47C5CD89FAC110F9 = 1318
64032: C93A01FA47C5CD96 = 1133
64040: FAC110F9C93A01FA = 1218
64048: 47C5CDA3FAC110F9 = 1344
64056: C9CD71FAC5CD7CFA = 1545
64064: CD96FAC110F6C9CD = 1466
64072: 71FAC5CD89FACD96 = 1507
64080: FAC110F6C9CD71FA = 1474
64088: C5CD89FACDA3FAC1 = 1600
64096: 10F6C9CD71FAC5CD = 1433
64104: 7CFACDA3FAC110F6 = 1447
64112: C93A00FA473A01FA = 889
64120: B8D047C9CDD4FACD = 1536
64128: B0FACD0FFCCD4FFB = 1433
64136: C9CDD9FACDB5FACD = 1714
64144: 43FCCD79FBC9CDD4 = 1514
64152: FACDB0FACDD7FBCD = 1757
64160: 01FBC9CDD4FACDB0 = 1501
64168: FACDA5FBCD2CFBC9 = 1572
64176: 3A02FA18093A00FA = 651
64184: 3D4F3A02FA812100 = 612
64192: 58A7280747112000 = 422
64200: 1910FD3A03FA856F = 849
64208: 2207FAC93A02FA18 = 826
64216: 093A00FA3D4F3A02 = 517
64224: FA8121004 0A72810 = 699
64232: 47112000197DFE20 = 556
64240: 3004 7CC607671 0F4 = 744
64248: 3A03FA856F2205FA = 844
64256: C92A07FA2B3A01FA = 852
64264: 5F1600193A00FA47 = 521
64272: C5E5E5D12B06003A = 971
64280: 01FA3D4FEDB8233A = 905
64288: 04FA77E1112000 19 = 672
64296: C110E5C92A07FA3A = 996
64304: 00FA47C5E5E5D123 = 1220
64312: 06003A01FA4F0DED = 644
64320: B02B3A04FA77E111 = 892
64328: 2000 19C110E5C92A = 738
64336: 07FA3A00FA3D473A = 755
64344: 01FAC5E51120001 9 = 751
64352: D1E506004FEDB0E1 = 1161
64360: C110EFE5D1133D4F = 1045
64368: 06003A04FA77EDB0 = 850
64376: C92A07FA3A00FA3D = 869
64384: 473A01FAC5E5A711 = 990
64392: 2000ED52D1E50600 = 795
64400: 4FEDB0E1C110EDE5 = 1392
64408: D1133D4F06003A04 = 436
64416: FA77EDB0C92A05FA = 1280
64424: 3A00FA47C5E50608 = 819
64432: C5E5E5D12306003A = 963
64440: 01FA3D4FEDB02BAF = 1022
64448: 77E124C110EAE17D = 1173
64456: C6206FFE2030047C = 803
64464: C60867C110D6C92A = 975
64472: 05FA3A01FA3D856F = 869
64480: 3A00FA47C5E50608 = 819
64488: C5E5E5D12B06003A = 971
64496: 01FA3D4FEDB823AF = 1022
64504: 77E124C110EAE17D = 1173
64512: C6206FFE2030047C = 803
64520: C60867C110D6C92A = 975
64528: 05FA3A00FA3D47C5 = 892
64536: EB627BC6206FFE20 = 1083
64544: 3004 7CC60867E506 = 720
64552: 08C5E5D506003A01 = 712
64560: FA4FEDB0D1E11424 = 1232
64568: C110EEE1C110D8CD = 1302
64576: 77FCC92A05FA3A00 = 927
64584: FA3D47C5EB627BD6 = 1249
64592: 206FFEE038047CD6 = 1019
64600: 0867E50608C5E5D5 = 993
64608: 06003A01FA4FEDB0 = 807
64616: D1E11424C110EEE1 = 1162
64624: C110D8CD77FCC906 = 1208
64632: 08C5E5E5D1133A01 = 950
64640: FA3D4FAF4777EDB0 = 1168
64648: E124C110ECC900 = 907
```

LUCIFER

▸Olaf Astrand ● Spectrum ● Sweden

First enter the Basic program and save it by using

Save "Lucifer" Linc 0

Restart your Spectrum and enter code loader run it and enter Main Code when you have done that Enter (Stop) and save code with

Save "MC" Code 46000,950

Then run code loader and enter Sprite Code. Address 40074 — 40840

Save it:

Save "SPRITES" Code 40000,850 Restart/Rewind and load all parts.

Controls Are:

Q=DROP
A=TAKE
N=LEFT
M=RIGHT
SPACE=JUMP.

```
6 LOAD ""CODE : LOAD ""CODE
7 INK 7: PAPER 0: BORDER 0: CLS
8 POKE 60000,2: POKE 60001,27: POKE 60003,208:
  POKE 60004,156
9 RANDOMIZE USR 46640: PRINT AT 3,28;"0"
10 LET DEPTH=44*8
11 LET Z=47*8+3
12 LET OX=INT ((Z-DEPTH)/8)
13 LET OY=(Z-DEPTH-OX*8)*3
14 LET OX=OX*3
15 LET Q=1
16 LET BOULDER=0
```

(continued on page 127)

File

(continued from page 126)

```
17 PRINT AT 17,26;"TIME"
18 LET MAP=45000
19 LET INKEY=5060
20 LET TIME=2500
22 RANDOMIZE USR 46522
60 GO SUB 7500
70 GO SUB 7000
100 REM Loop
110: LET A$=INKEY$: GO SUB 7700
112 IF CODE A$>96 THEN LET A$=CHR$ (CODE A$-32)
115: IF A$="" THEN GO TO 110
120: IF A$="A" THEN GO SUB 2000
130: IF A$="W" THEN GO SUB 3000
140: IF A$="W" THEN GO SUB 4000
150: IF A$="Q" THEN GO SUB 1000
160: IF A$=" " THEN GO SUB 5000
170: GO SUB 7000
180: GO SUB 6000
185: GO SUB 7700
190 GO TO 100
1020 IF PEEK (MAP+Z-8)<>0 THEN GO TO 110
1030 IF BOULDER=0 THEN RETURN
1040 LET BOULDER=BOULDER-1
1046 PRINT AT 3,28;BOULDER
1050 POKE MAP+Z,2
1060 LET Z=Z+1: GO SUB 7000
1070 IF OX=15 Th. RETURN
1080 POKE 60000,(0+ `
1090 POKE 60001,0Y
1100 POKE 60003,20R
1110 POKE 60004,156
1120 RANDOMIZE USR 46640
1130 RETURN
1020 IF PEEK (MAP+Z+8)<>2 THEN GO TO 110
1030 IF BOULDER=3 THEN RETURN
1040 LET BOULDER=BOULDER+1
2046 PRINT AT 3,28;BOULDER
2050 LET Z=Z+8
2060 POKE MAP+Z,0
2080 RETURN
3020 IF Q=1 THEN LET Q=-1: RETURN
3040 IF PEEK (MAP+Z-1)<>0 THEN RETURN
3060 LET Z=Z-1
3080 RETURN
4020 IF Q=-1 THEN LET Q=1: RETURN
4030 IF PEEK (MAP+Z+1)=8 THEN      GO TO 8000
4040 IF PEEK (MAP+Z+1)<>0 THEN RETURN
4060 LET Z=Z+1
4080 RETURN
5020 IF PEEK (MAP+Z-8)<>0 THEN GO TO 110
5030 IF PEEK (MAP+Z-Q)<>0 THEN LET Z=Z-8: GO SUB
     7000 : GO TO INKEY
5040 IF PEEK (MAP+Q+Z-8)<>0 THEN LET Z=Z-8:
     GO SUB 7000: GO TO INKEY
5050 LET Z=Z-8+Q
5055 GO SUB 7000
5060 LET A$=INKEY$
5070 IF CODE A$>96 THEN LET A$=CHR$
     (CODE A$-32)
5080 IF A$="Q" THEN IF BOULDER>0 THEN
     GO SUB 1000: LET A=0: RETURN
5090 LET A=0
5100 IF PEEK (MAP+8+Q+Z)=0 THEN IF PEEK
     (MAP+Q+Z)=0 THEN LET Z=Z+8+Q: RET
5110 IF PEEK (MAP+Q+Z)=0 THEN LET Z=Z+Q
5130 RETURN
6020 IF PEEK (MAP+Z+8)<>0 THEN RETURN
6040 LET A$=INKEY$
6050 IF CODE A$>96 THEN LET A$=CHR$ (CODE A$-32)
6060 IF A$="Q" THEN IF BOULDER>0 THEN GO SUB
     1000: RETURN
6080 LET Z=Z+8
6090 LET A=0
6095 GO SUB 7000
6100 GO TO 6020
7010 LET NX=INT ((Z-DEPTH)/8)
7020 LET NY=Z-DEPTH-NX*8
7040 IF Q=1 THEN POKE 60004,157: POKE 60003,168
7050 IF Q=-1 THEN POKE 60004,157: POKE 60003,96
7070 LET NX=NX*3
7080 LET NY=NY*3
7100 LET X=(NX-OX)/3
7110 LET Y=(NY-OY)/3
7150 POKE 60009,OX
7160 POKE 60010,OY
7300 LET OX=OX+X
7310 LET OY=OY+Y
7340 POKE 60000,OX
7350 POKE 60001,OY
7365 RANDOMIZE USR 46822
7370 RANDOMIZE USR 46640
7390 IF NX<>OX OR NY<>OY THEN GO TO 7130
7410 IF OX=18 THEN LET OX=3: LET DEPTH=DEPTH+60:
     GO SUB 7500: GO TO 7000
7420 IF OX=0 THEN LET OX=15: LET DEPTH=DEPTH-60:
     GO SUB 7500: GO TO 7000
7440 RETURN
7510 LET H=INT (DEPTH/256)
7520 LET L=DEPTH-H*256
7540 POKE 60004,L
7550 POKE 60007,H
7570 RANDOMIZE USR 46535
7580 PRINT AT 10,26;"TIME"
7585 PRINT AT 11,27;DEPTH;" "
7590 RETURN
7720 LET TIME=TIME-1
7730 PRINT AT 18,26;TIME;" "
7740 IF TIME>0 THEN RETURN
7750 PRINT AT 10,5;"IT IS ALL OVER"
7760 PRINT AT 11,4;"YOUR  TIME IS UP"
7770 FOR F=1 TO 100: NEXT F
7780 POKE 60003,88: POKE 60004,159
7790 RANDOMIZE USR 46640
7800 FOR F=1 TO 10: NEXT F
7810 POKE 60003,16: POKE 60004,159
7820 RANDOMIZE USR 46640
7999 GO TO 7
8000 REM *** IOFF ***
8100 POKE 60001,3+PEEK 60001
8110 POKE 60003,24: POKE 60004,157
8120 RANDOMIZE USR 46640
8130 PRINT AT 0,0;"    CONGRATULATIONS !!
     YOU HAVE TURNED THE ILLUSIO  OFF"
8135 POKE 60000,9: POKE 60001,6
8136 POKE 60009,9: POKE 60010,9:
     RANDOMIZE USR 46822
8140 POKE 60003,88: POKE 60004,159
8150 RANDOMIZE USR 46640
8160 FOR F=1 TO 10: NEXT F
8170 POKE 60003,16: POKE 60004,159
8180 RANDOMIZE USR 46640
8190 FOR F=1 TO 10: NEXT F
8200 POKE 60003,16: POKE 60004,159
8205 POKE 60000,0Y: POKE 60001,0Y
8210 RANDOMIZE USR 46640
8220 FOR F=0 TO 500: NEXT F
8230 GO TO 7
```

Hex loader.

```
10 DEF FN h(h$)=16*(CODE h$(1)
-48-(7 AND h$(1)>"9")+CODE h$(2
)-48-(7 AND h$(2)>"9")
19 REM hfdhd
20 INPUT "Start ";m
30 INPUT "Finish ";f
39 REM fd
40 FOR n=m TO f STEP 8
50 LET tot=0: PRINT n;": ";
60 INPUT h$: PRINT h$;
70 LET x=0
80 FOR b=1 TO LEN h$ STEP 2
90 LET z=FN h(h$): LET tot=tot
+z
100 POKE n+x,z
110 LET h$=h$(3 TO ): LET x=x+1
120 NEXT b
130 PRINT " = ";: INPUT t: PRIN
T t
140 IF tot<> THEN PRINT "inpu
t error - try again": GO TO 50
150 NEXT n
160 REM enter STOP to stop
```

Machine code.

```
46000 1,1,1,1,1,1,1,1,   : 8
46008 1,0,0,0,0,0,0,1,   : 10
46016 1,0,0,7,0,0,0,1,   : 16
46024 1,0,0,0,1,1,0,1,   : 10
46032 1,0,0,0,0,0,0,1,   : 10
46040 1,0,0,1,0,0,0,1,   : 4
46048 1,0,0,1,1,1,0,1,   : 5
46056 1,0,1,1,0,0,0,1,   : 5
46064 1,0,0,1,1,0,1,1,   : 6
46072 1,0,0,0,0,0,0,1,   : 2
46080 1,2,2,2,0,0,0,1,   : 2
46088 1,1,2,1,0,0,0,1,   : 2
46096 1,1,1,1,1,0,0,1,   : 6
46104 1,0,1,0,0,0,0,1,   : 2
46112 1,0,0,0,0,0,1,1,   : 3
46120 1,0,1,1,1,0,1,1,   : 6
46128 1,0,0,0,0,0,0,1,   : 2
46136 1,0,0,1,2,0,1,1,   : 6
46144 1,0,0,1,2,2,0,1,   : 7
46152 1,0,1,1,1,1,1,1,   : 8
46160 1,0,0,0,0,0,1,1,   : 3
46168 1,1,1,1,1,0,0,1,   : 7
46176 1,0,0,0,0,0,0,1,   : 2
46184 1,0,0,1,1,1,1,1,   : 6
46192 1,0,0,0,0,0,0,1,   : 2
46200 1,1,1,1,1,1,1,1,   : 8
46208 1,1,0,0,0,1,2,1,   : 6
46216 1,0,0,1,0,1,1,1,   : 6
46224 1,0,0,1,2,0,1,1,   : 7
46232 1,0,1,1,1,1,1,1,   : 7
46240 1,0,0,0,0,0,0,1,   : 2
46248 1,0,0,0,1,1,2,1,   : 7
46256 1,0,0,1,0,1,2,1,   : 7
46264 1,0,0,0,0,1,1,1,   : 6
46272 1,1,1,0,0,0,1,1,   : 5
46280 1,0,0,0,1,0,0,1,   : 3
46288 1,2,1,0,1,1,1,1,   : 7
46296 1,2,1,0,1,1,1,1,   : 7
46304 1,2,0,0,0,0,0,1,   : 2
46312 1,1,1,1,1,1,1,1,   : 8
46320 0,0,13,176,179,17,200,175,   : 780
46328 1,8,2,237,176,201,0,0,0,1,   : 868
46336 33,200,175,237,75,102,234,9,   : 1065
46344 22,0,30,0,70,229,213,4,   : 568
46352 33,248,155,17,72,247,75,16,   : 566
46360 253,36,99,234,209,225,237,83,   : 1374
46368 5,236,237,83,97,234,35,229,   : 1264
46376 213,205,48,180,209,225,28,28,   : 1138
46384 28,62,22,187,68,214,20,20,   : 601
46392 20,62,19,186,68,204,251,201,   : 991
46400 84,136,208,24,96,168,240,56,   : 992
46408 128,200,18,88,0,0,0,0,   : 432
46416 0,0,0,0,0,0,0,0,   : 0
46424 66,66,5,69,8,121,4,4,   : 341
46432 0,0,0,0,0,0,0,0,   : 0
46440 203,61,182,205,81,182,205,97,   : 1238
46448 182,205,105,182,201,58,96,234,   : 1263
46456 1,0,8,33,0,64,25,7,   : 135
46464 186,218,200,50,8,147,9,24,   : 879
46472 247,71,243,175,186,40,8,241,   : 1211
46480 17,32,0,25,16,253,201,241,   : 785
46488 201,237,75,97,234,6,9,9,   : 859
46496 201,79,237,91,99,234,8,217,   : 1166
46504 6,1,175,217,8,6,8,24,   : 449
46512 119,19,35,26,119,19,35,26,   : 398
46520 119,19,197,1,254,0,9,193,   : 792
46528 16,237,8,217,3,184,40,26,   : 733
46536 217,8,11,187,197,1,224,7,   : 833
46544 237,66,193,62,8,185,32,213,   : 996
46552 197,1,0,7,9,193,16,0,   : 421
46560 26,203,217,8,253,33,96,234,   : 1068
46568 33,226,87,253,70,0,4,17,   : 688
46576 32,0,25,16,253,253,78,1,   : 428
46584 6,0,9,22,0,58,99,234,   : 492
46592 221,33,8,182,221,86,0,221,   : 878
46600 35,186,32,248,221,126,19,6,   : 483
46608 5,17,30,0,119,35,119,35,   : 358
46616 119,25,16,248,201,0,205,243,   : 1057
46624 182,205,7,183,205,23,183,205,   : 1195
46632 31,183,201,58,105,234,1,0,   : 813
46640 8,33,0,64,22,7,186,216,   : 536
46648 200,30,8,147,9,24,247,71,   : 736
46656 243,175,186,40,8,241,17,32,   : 962
46664 0,25,16,253,201,241,201,237,   : 1174
46672 75,106,234,6,0,9,201,79,   : 710
46680 8,217,6,3,175,217,8,6,   : 640
46688 8,42,0,119,35,62,0,119,   : 405
46696 35,62,0,119,187,1,254,0,   : 668
46704 9,193,16,237,8,217,5,184,   : 869
46712 40,26,217,0,12,167,197,1,   : 668
46720 224,7,237,66,193,62,8,185,   : 852
46728 32,213,197,1,0,7,9,193,   : 652
46736 16,0,26,203,217,8,201,0,   : 67
46744 0,0,0,0,0,0,0,0,
```

Sprite code.

```
46076 0,255,31,243,255,63,251,255,   : 1353
46084 191,255,255,191,247,255,191,247,   : 1828
46092 255,31,247,0,255,224,31,224,   : 1235
46100 63,252,255,127,254,255,63,   : 1283
46108 254,255,51,254,255,224,0,252,   : 1525
46116 255,239,123,255,247,255,247,   : 1619
46124 127,255,128,255,0,0,127,31,   : 925
46132 240,0,127,252,255,127,254,255,   : 1510
46140 127,254,255,63,252,128,0,0,   : 1077
46148 0,127,0,3,207,128,14,   : 479
46156 55,160,28,255,120,29,62,252,   : 961
46164 61,255,232,31,255,254,127,255,   : 1510
46172 190,127,224,190,128,6,190,127,   : 1183
46180 127,252,127,247,48,119,255,238,   : 1546
46188 79,251,222,127,247,254,127,239,   : 1960
46196 127,253,255,127,247,255,127,239,   : 1952
46204 255,255,255,255,247,241,247,241,   : 2349
46212 255,255,255,255,247,241,247,241,   : 2349
46220 255,255,255,255,247,241,247,241,   : 2349
46228 255,255,255,255,247,241,247,241,   : 2349
46236 239,234,73,255,255,128,16,   : 1029
46244 149,109,171,149,73,186,151,73,   : 1061
46252 186,151,73,255,255,0,127,   : 1037
46260 0,1,128,192,6,96,48,25,   : 496
46268 206,108,32,56,146,110,224,144,   : 1026
46276 143,64,119,51,50,194,193,   : 825
46284 146,129,0,1,158,247,189,82,   : 872
46292 146,32,82,151,56,30,148,32,   : 679
46300 7,62,16,148,33,80,244,45,98,0,   : 664
46308 26,41,200,38,52,8,140,18,   : 523
46316 127,152,24,231,48,11,18,32,   : 686
46324 0,7,62,16,236,192,0,3,0,0,   : 445
46332 0,0,0,0,0,0,0,0,   : 0
46340 0,0,0,0,0,0,0,0,   : 0
46348 0,0,0,0,0,0,0,0,   : 0
46356 7,239,0,1,222,0,0,0,   : 469
46364 0,0,0,0,0,0,0,2,   : 2
46372 0,0,0,0,0,0,0,0,   : 321
46380 0,0,0,0,0,0,0,0,   : 705
46388 0,0,0,0,0,0,0,0,   : 873
46396 127,96,0,208,160,0,198,176,   : 963
46404 0,0,199,80,0,227,112,0,231,   : 849
46412 0,20,239,26,7,234,0,212,   : 596
46420 128,0,56,110,0,1,247,0,   : 538
46428 0,247,190,0,123,192,0,109,   : 863
46436 0,0,187,128,1,111,192,2,   : 621
46444 192,224,3,56,103,3,20,224,   : 825
46452 0,111,192,1,223,193,1,190,   : 837
46460 192,0,115,128,0,237,128,0,   : 800
46468 119,0,1,190,192,1,221,224,   : 950
46476 7,227,240,16,127,188,6,127,   : 936
46484 192,0,95,128,0,79,128,0,   : 582
46492 0,0,0,0,0,0,0,0,128,   : 327
46500 0,225,192,1,243,224,0,0,   : 885
46508 0,63,255,252,96,0,6,203,   : 875
46516 162,58,171,36,43,58,36,41,   : 601
46524 43,187,185,128,0,1,131,229,   : 904
46532 1,130,167,1,130,33,1,128,   : 591
46540 0,1,128,0,1,157,207,177,   : 671
46548 249,74,161,213,232,185,64,0,   : 1078
46556 1,107,60,5,34,32,3,43,   : 287
46564 45,221,41,37,85,31,61,221,   : 762
46572 16,0,1,31,255,255,0,2,   : 380
46580 0,44,0,0,88,0,0,   : 132
46588 176,0,1,96,0,1,192,0,   : 467
46596 5,128,0,0,0,0,0,0,   : 262
46604 0,0,0,0,0,188,0,0,156,   : 156
46612 0,0,248,0,0,112,0,0,   : 360
46620 0,0,0,0,0,0,0,0,   : 0
46628 0,0,0,0,0,0,0,0,   : 0
46636 0,0,0,0,0,0,0,0,   : 0
46644 0,0,0,0,0,0,0,0,   : 0
46652 0,0,0,0,0,0,0,0,   : 0
46660 255,170,129,170,174,52,170,   : 1120
46668 164,183,170,238,181,128,0,0,   : 1064
46676 255,255,255,247,241,247,241,   : 1863
46684 39,245,113,39,255,255,255,255,   : 1456
46692 255,255,183,143,251,148,210,75,   : 1521
46700 132,234,73,255,255,255,128,16,   : 1328
46708 1,186,151,73,186,151,73,171,   : 1029
46716 149,109,171,149,73,186,151,73,   : 1061
46724 128,16,1,255,255,255,0,127,   : 1037
46732 0,1,128,192,6,96,48,25,   : 496
46740 206,108,32,56,146,110,224,144,   : 1026
46748 143,64,119,51,50,194,193,   : 825
46756 146,129,0,1,158,247,189,82,   : 872
46764 146,32,82,151,56,30,148,32,   : 679
46772 16,148,33,80,244,45,98,0,   : 664
46780 26,41,200,38,52,8,140,18,   : 523
46788 172,152,24,231,48,11,18,32,   : 686
46796 14,236,192,0,3,0,0,0,   : 445
46804 0,0,0,0,0,0,0,0,   : 0
46812 0,0,0,0,0,0,0,0,   : 0
46820 0,0,0,0,0,0,0,0,   : 0
46828 0,0,0,0,0,0,0,0,   : 0
46836 48,96,1,44,18,2,25,16,2,   : 292
46844 0,26,179,96,2,166,192,0,76,0,   : 711
46852 0,67,0,0,44,0,0,0,   : 111
46860 0,0,0,0,0,0,0,0,   : 0
46868 0,0,0,0,0,0,0,0,   : 0
46876 0,0,0,0,0,0,0,0,   : 0
46884 0,0,0,0,0,0,0,0,   : 0
46892 0,0,0,0,0,0,0,0,   : 0
46900 0,0,0,0,0,0,0,0,   : 0
46908 0,0,0,0,0,0,0,0,   : 0
46916 0,0,0,0,0,0,0,0,   : 0
46924 0,0,0,0,0,0,0,0,   : 0
46932 0,0,0,0,0,0,0,0,   : 0
46940 0,0,0,0,0,0,0,0,   : 0
46948 0,0,0,0,0,0,0,0,   : 0
46956 0,0,0,0,0,0,0,0,   : 0
46964 0,0,0,0,0,0,0,0,   : 0
46972 0,0,0,0,0,0,0,0,   : 0
46980 0,0,0,0,0,0,0,0,   : 0
46988 0,0,0,0,0,0,0,0,   : 0
46996 0,0,0,0,0,0,0,0,   : 0
47004 0,0,0,0,0,0,0,0,   : 0
47012 0,0,0,0,0,0,0,0,   : 0
47020 0,0,0,0,0,0,0,0,   : 0
47028 0,0,0,0,0,0,0,0,   : 0
47036 0,0,0,0,0,0,0,0,   : 0
47044 0,0,0,0,0,0,0,0,   : 0
47052 0,0,0,0,0,0,0,0,   : 0
47060 0,0,0,0,0,0,0,0,   : 0
47068 0,0,0,0,0,0,0,0,   : 0
47076 0,0,0,0,0,0,0,0,   : 0
47084 0,0,0,0,0,0,0,0,   : 0
47092 0,0,0,0,0,0,0,0,   : 0
47100 0,0,0,0,0,0,0,0,   : 0
47108 0,0,0,0,0,0,0,0,   : 0
47116 0,0,0,0,0,0,0,0,   : 0
47124 0,0,0,0,0,0,0,0,   : 0
47132 0,0,0,0,0,0,0,0,   : 0
47140 0,0,0,0,0,0,0,0,   : 0
47148 0,0,0,0,0,0,0,0,   : 0
47156 0,0,0,0,0,0,0,0,   : 0
47164 0,0,0,0,0,0,0,0,   : 0
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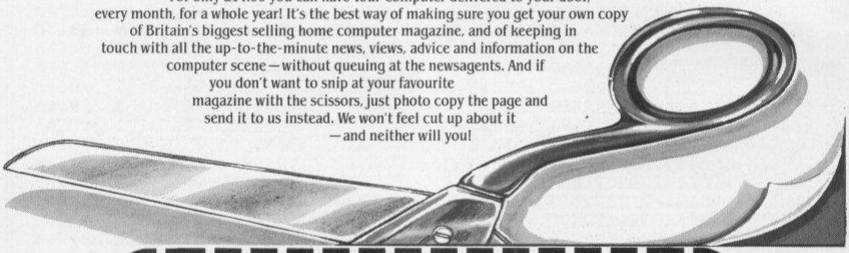

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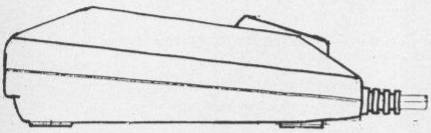

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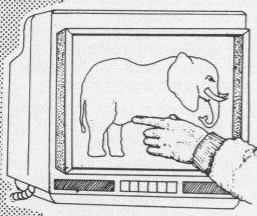

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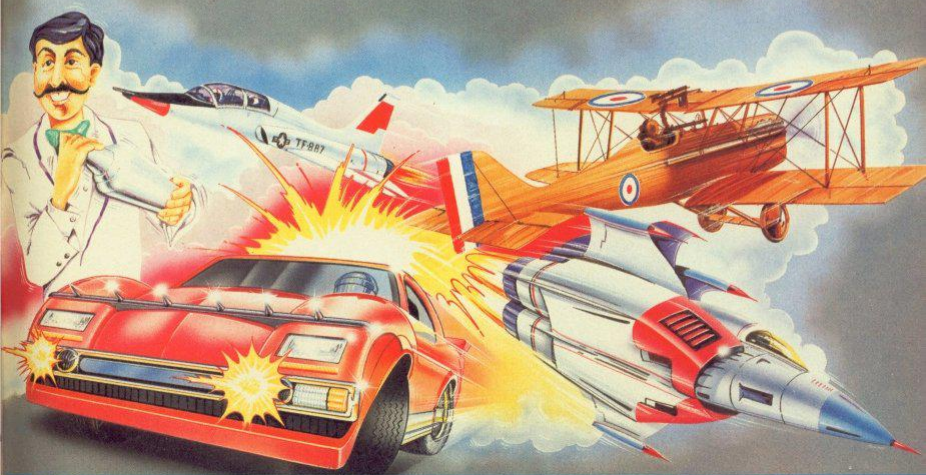

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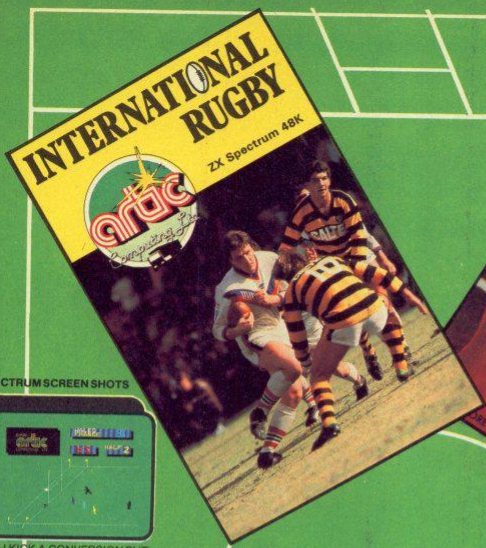

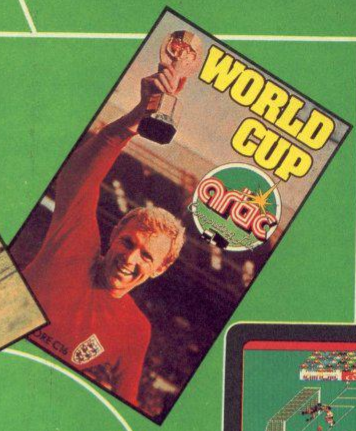

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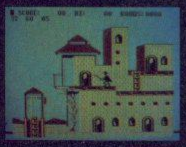

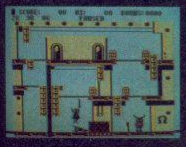

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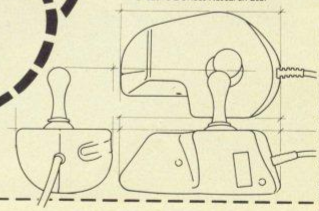

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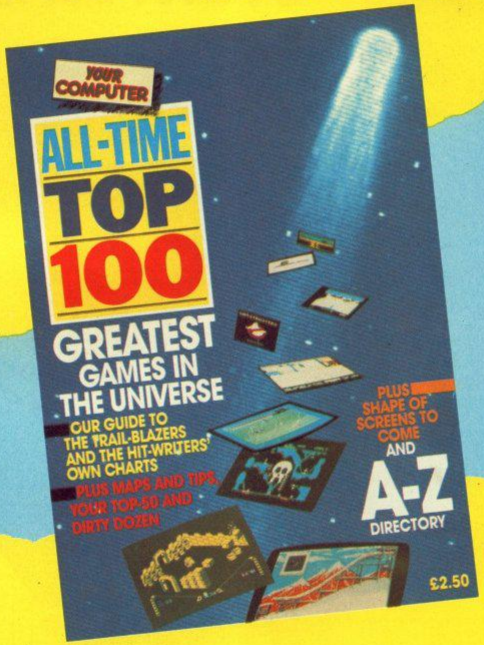

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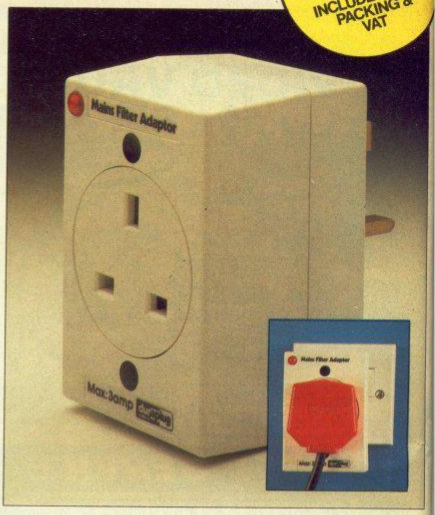

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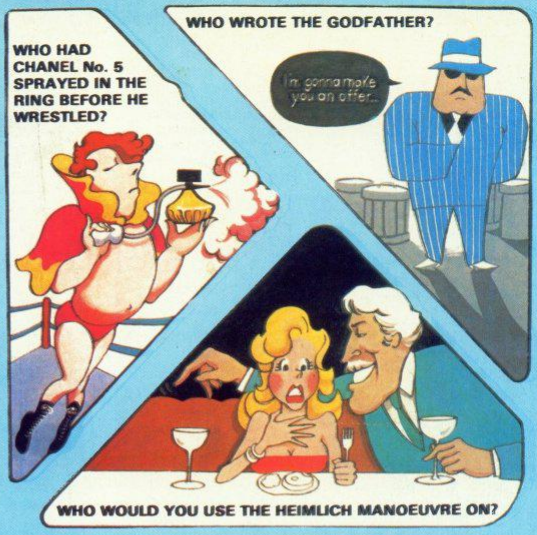

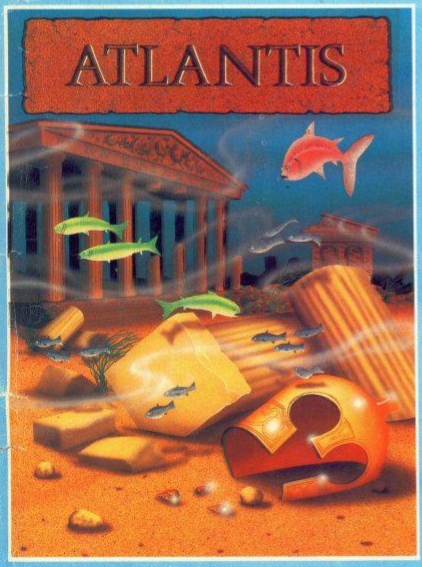

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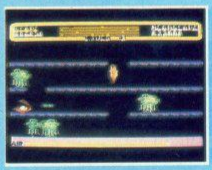

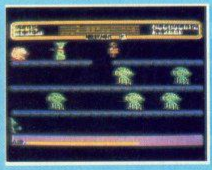

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